AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

APRIL 1, 1959

Features • • •

Automotive and Aviation Manufacturing

ENGINEERING • PRODUCTION • MANAGEMENT

Gets 40% savings in coolant costs by change to

Standard's Transparent Coolant

ARGON Oil No. 4

Chicago Saws, Inc., realizes other benefits in switch to this Standard Oil product

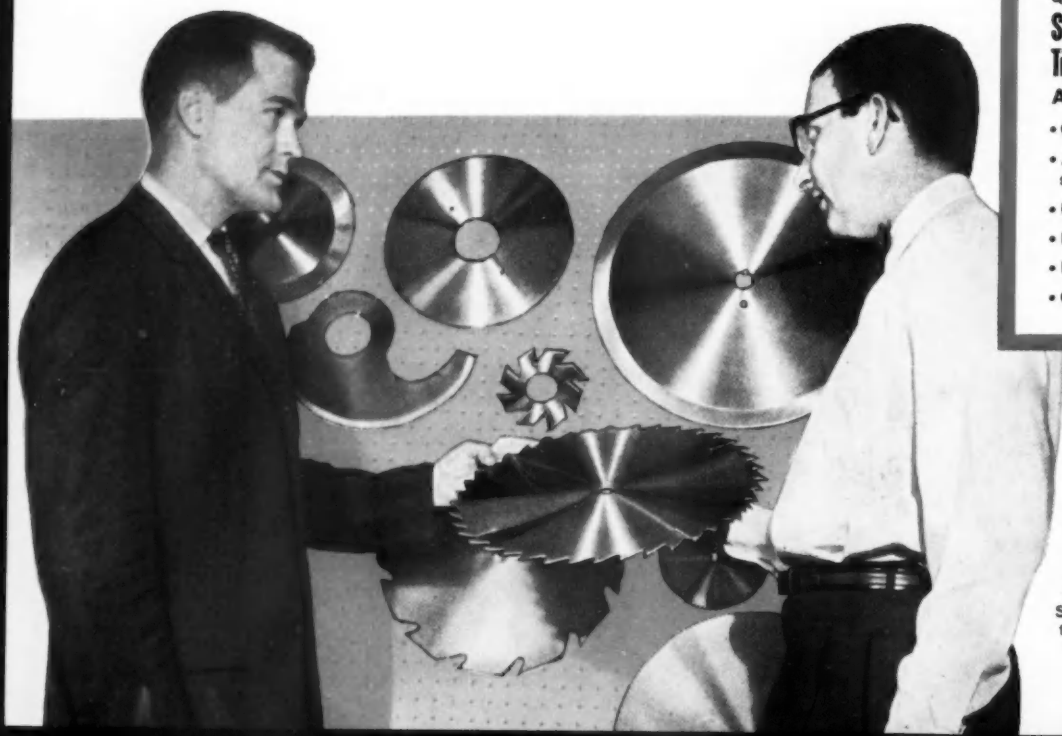
Situation: It all started when a Standard Oil lubrication specialist recommended ARGON Oil No. 4, Standard's transparent coolant to Chicago Saws for use in their grinding operations. This manufacturer of rotary saw blades decided to give it a try. They knew the product was the result of more than three years' work in Standard's research laboratory, and that it had been extensively field tested.

What happened: Using ARGON Oil No. 4 in 100:1 concentration, Chicago Saws was able to reduce coolant costs 40%. They also found the work could be seen more clearly when using this coolant. There was less wheel loading. They also discovered the coolant didn't foam and that its exceptional ability to carry off heat resulted in cooler operation. Faster cuts were obtained with finer wheels. Tolerances were easier to hold. Better finishes were obtained. Less frequent wheel dressings were required.

What you can do: Get more information about ARGON Oil No. 4 transparent coolant. Call the Standard Oil lubrication specialist near you in any of the 15 Midwest or Rocky Mountain states. Or write: **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Using ARGON Oil No. 4, Chicago Saws gets better finish at savings of 40% over other coolants tried. Operator is using .004" cut on heat treated Rockwell 60 C steel.

You expect more from **STANDARD** *and you get it!*



Quick facts about

Standard's Transparent Coolant

ARGON Oil No. 4

- Clear, transparent fluid
- All chemical. Does not support bacteria growth
- Unaffected by humidity
- Nonfoaming
- Fire resistant
- Odorless

Standard's Bob Stark and Chicago Saws' vice president Paul Bostrom discuss blades and coolants. Bob Stark is well qualified to work with manufacturers on the use of metalworking coolants. Bob has a chemistry degree from Illinois College plus three years' experience at Standard. He has completed the Standard Oil Sales Engineering School course.

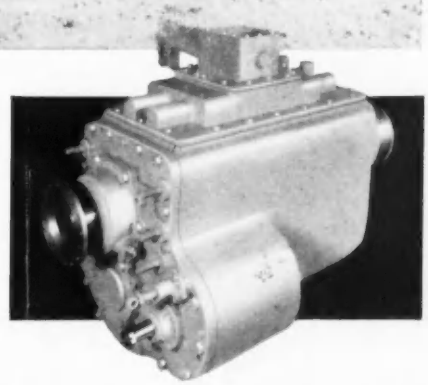
Circle 101 on Inquiry Card, for more Data

40 tons of ore...

trip after trip, hour after hour, with **COTTA HEAVY-DUTY TRANSMISSIONS**

Dart Truck Company, Kansas City, Missouri, moves more tons per hour with their huge ore-hauling trucks using COTTA Heavy-Duty Transmissions. These trucks are in service in the large copper mines of the Southwest and in the Mesabi Iron Range of Minnesota. Powered with Cummins V-12 engines (400 HP) and equipped with Twin Disc 3-stage torque converters and COTTA GA-966 transmissions, two truck models are rated at 35 tons and 50 tons.

The COTTA Model GA-966 is another specially engineered heavy duty transmission which meets the rigid requirements of these giant trucks. Compact, rugged, easy to control, it combines three forward speeds and a reverse with the converter for smooth power flow through a wide range of torque and speed conditions. It has the same special heavy-duty features that make COTTA Transmissions and Reduction Gears so important to builders of cranes, locomotives, pumps, drilling rigs, trucks, hoists, and other equipment requiring heavy-duty or special gear-boxes.



If you are considering torque converters for your mobile equipment . . . or if you have any speed change or reversing problem that requires extreme ruggedness and dependability in the input range of 150 to 2000 foot-pounds, take advantage of the offer described below — find out what Cotta can do for you!

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA

HEAVY-DUTY TRANSMISSIONS

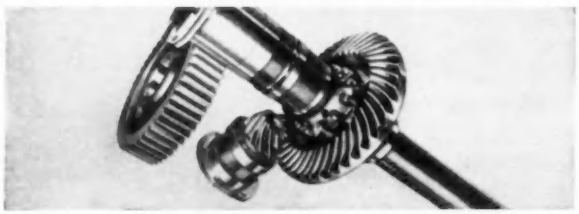
"Engineered-to-order"

*18-ton payloads are moved by four Allis-Chalmers Mfg. Co. TS-260 motor scrapers. Ni-Cr-Mo steels help make their drives rugged.

3 Nickel-chrome-moly steels give drives the strength to move mountains

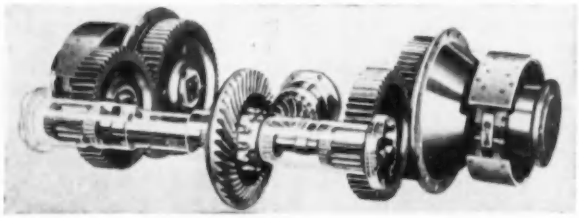
Drives for the Allis-Chalmers 20-ton "mountain" moving scrapers* are made for heavy duty . . . made with 3 outstanding nickel-chromium-molybdenum steels . . . steels that may well provide just the end properties and processing behavior you're going after.

FOR SPIRAL RING GEAR AND BEVEL PINION . . . AISI 4320



These heaviest duty gears need 4320 to give a combination of great strength and toughness and high wear resistance. Carburized and hardened this steel develops a high core strength in heavy sections, along with a tough wear resistant case.

FOR DIFFERENTIAL SPIDERS, SIDEGEARS, BEVEL PINION . . . AISI 8620
FOR FINAL DRIVE BULL GEARS, IDLERS, PINIONS . . . AISI 8627



They are economical in cost and processing with the ability to develop adequate strength in medium sections with 8620 and heavier sections with 8627.

NICKEL MAKES ALLOYS PERFORM BETTER LONGER. If you are looking for the best steel to suit your particular engineering and economic requirements, consider the nickel-containing steels. Inco's D & R div. has helpful information on regular and new steels. We will be glad to make it available to you, just write.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N. Y. INCO NICKEL

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

APRIL 1, 1959 VOL. 120 No. 7

Features • • •

. . . *continued on next page*

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AUTOMOTIVE INDUSTRIES

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FROM NEW YORK: "All four of my brakes are always perfectly adjusted whether I'm on the throughway or driving in bumper-to-bumper traffic in the city."

FROM DENVER: "There's new pleasure in mountain driving now that I know my brakes always have maximum stopping power."

FROM ATLANTA: "Knowing our brakes are never out of adjustment gives me a wonderful safe feeling. I'm at ease even when taking the children to school."

FROM MINNEAPOLIS: "In all kinds of weather, self-adjusting brakes give me stopping power at its best—and save the cost of brake adjustments."

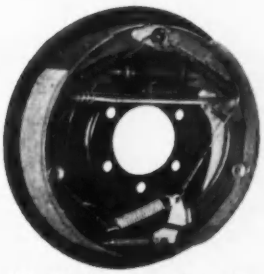
AGAIN . . . BRAKES ARE NEWS IN DEALERS' SHOWROOMS!

Bendix* Self-Adjusting Brakes give dealers a double-barreled sales appeal: safety plus economy. And those in close touch with today's market know that these two appeals —safety and economy—are among the most powerful sales points that can be made to the American buying public.

Car prospects quickly realize that there's real safety in always maintaining the brakes at maximum stopping power. And the obvious savings that they make by eliminating the expense and bother of periodic brake adjustments. What's more, with all brake shoes always correctly adjusted, there's always the right clearance between pedal and floor. And that's a feeling any car buyer appreciates.

Reasons like these make self-adjusting brakes a good "talking piece" for dealers. It won't be long before car buyers everywhere will know about self-adjusting brakes —and want them. But this latest advancement in brakes joins power brakes and power steering as examples of how Bendix pioneers and develops improvements to meet the needs of the automobile industry.

*TRADEMARK



When shoe clearance exceeds a predetermined amount, a ratchet sets up the star wheel adjuster one notch—as the brakes are applied when the car is in reverse. This automatically adjusts the shoes to exactly the right fit within the drum and compensates for lining wear.

Bendix PRODUCTS DIVISION South Bend, IND.

Circle 106 on Inquiry Card, for more Data

Bendix AVIATION CORPORATION

There's no substitute for the FORGED crankshaft

Crankshaft forgings illustrated, left to right, for V-8 passenger car, diesel truck and heavy tractor engines

Crankshafts have been made successfully by other methods of fabrication and have proven to be *good enough* for certain non-critical applications — but for maximum dependability of the modern, compact, high compression, high torque engine a forged crankshaft is essential.

The forging process assures, to the greatest degree possible, uniformity and predictability of physical properties with a minimum variance from piece to piece or from one location to another in the same piece.

Wyman-Gordon has been forging crankshafts since the beginning of the internal combustion engine era and today produces more crankshafts for a greater variety of applications than any other company in the world.

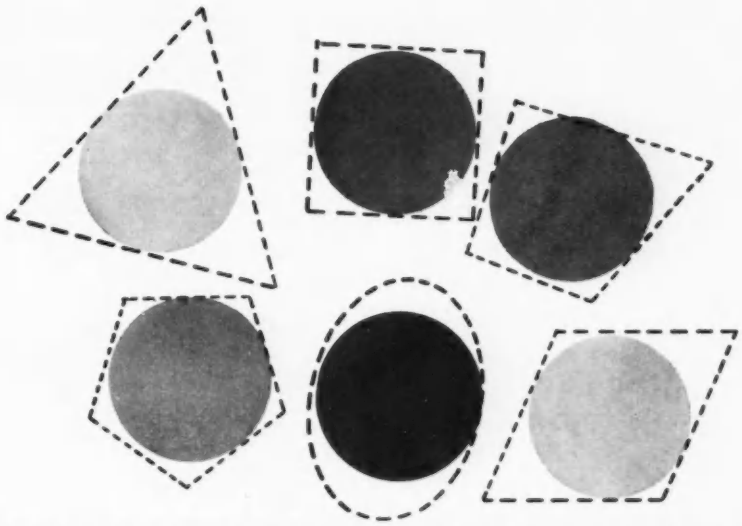
In a crankshaft there is no substitute for a forging, and in a forging there is no substitute for Wyman-Gordon quality and experience.

WYMAN-GORDON COMPANY

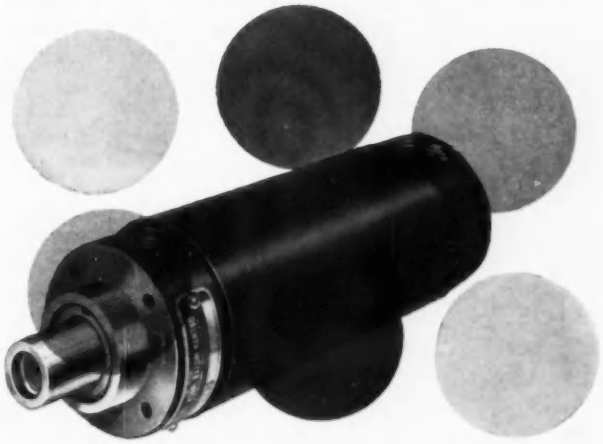
Established 1883

WORCESTER 1, MASSACHUSETTS
HARVEY, ILLINOIS • DETROIT, MICHIGAN

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM



Air 150 psi
Hydraulic up to 1500 psi
Meet JIC Standards
Series 101A



O-M Cylinders Fit Where Others Won't

THESE original space-saving O-M cylinders do more than fit into unusually close quarters too small to accommodate tie-rod cylinders of the same size bore. They save weight, improve appearance and assure smooth, dependable performance within a wide range of operating pressures. In addition, they are readily modified to serve in special applications, requiring semi-standard cylinders. And, the O-M Internal Locking Key, that makes it possible to orient the ports to any position, simplifies disassembly, inspection and service, eliminating alignment problems upon assembly. Completely interchangeable mounts and parts.

Available in 1½" to 8" bores with standard or heavy-duty piston rods.

Mail coupon today for 28-page Bulletin 101A replete with engineering drawings of cylinders, mounts, mounting brackets, capacity chart, and other performance data.

ORTMAN-MILLER MACHINE CO.
17 143rd Street Hammond, Indiana

■ **Have representative call**
■ **Send Bulletin 101A**

NAME_____ POSITION_____

COMPANY_____

ADDRESS_____

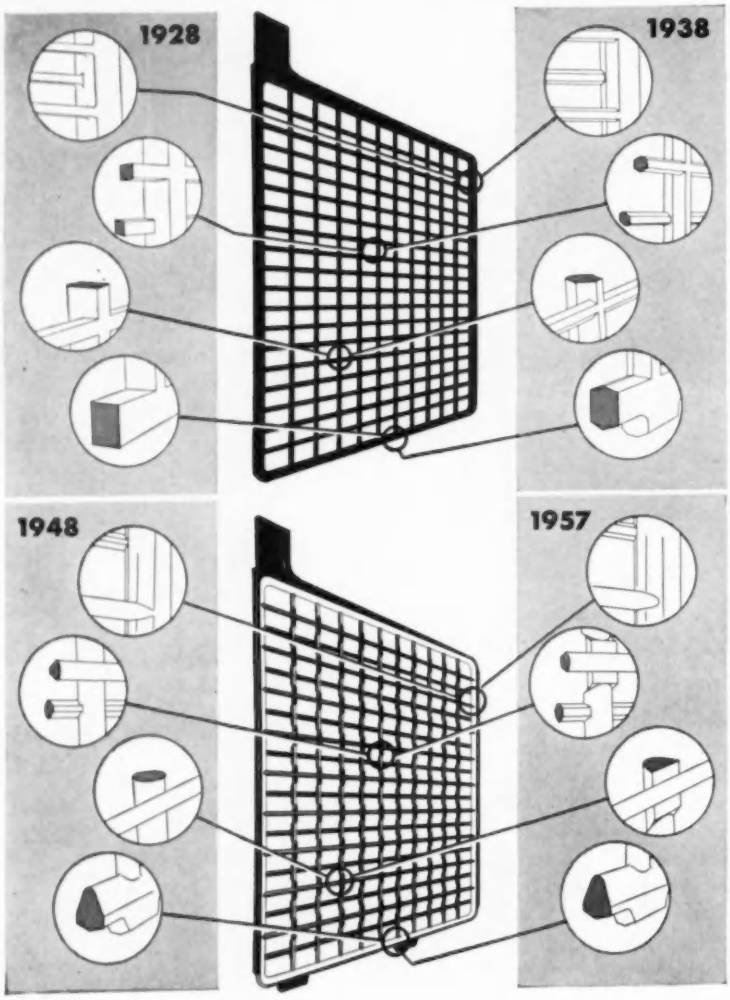
CITY_____ ZONE_____ STATE_____

Circle 108 on Inquiry Card, for more Data

to GLOBE RESEARCH no battery is ever perfect

from Globe Research

Significant design changes in grid cross sections 1928 through 1957



. . . grids that are designed for:

- **High strength**
- **Corrosion resistance**
- **Good conductivity**
- **Greater oxide retention**

Charts at the left illustrate progressive changes in grid design resulting from Globe's 30-year advance toward battery perfection through research and development. These changes are small physically, but very significant in bringing buyers the efficient, low-cost, peak-performance battery of today . . . the Globe Spinning Power Battery . . . unsurpassed in quality for either original equipment or replacement.

For more information on grid design write for Bulletin G57.

Globe Spinning Power Batteries are now available for fast, low-cost shipment from 16 strategically located plants — 15 (*) now producing dry-charged batteries:

*ATLANTA, GA., *DALLAS, TEXAS, *EMPORIA, KANSAS, *HOUSTON, TEXAS, *LOUISVILLE, KY., *MEDFORD, MASS., *MEMPHIS, TENN., *MILWAUKEE, WIS., *MINERAL RIDGE, OHIO, *PHILADELPHIA, PA., *REIDSVILLE, NO. CAROLINA, *SAN JOSE, CALIF., *HASTINGS-ON-HUDSON, NEW YORK, *LOS ANGELES, CALIF., OREGON CITY, OREGON, *TAMPA, FLORIDA.

SPINNING POWER GLOBE-UNION SPLIT-SECOND STARTING

GLOBE-UNION INC.

MILWAUKEE 1, WISCONSIN

If it's Petroleum-powered there's a GLOBE-BUILT BATTERY right from the start!

Aircraft Components Manufacturer Specifies

OSTUCO *Forged Tubing*

FOR LOWER MACHINING COSTS

Forging tube end in Shelby mill. In addition, Ohio Seamless can supply tubing flared, swaged, expanded, upset, flanged, shaped, etc.

"Our machining time on this landing gear part in SAE 4140 plummeted from *400 to 180 minutes* when we changed from forgings to Ostuco Forged Tubing.

"In addition to getting *over 80% more parts per workshift*, we like the free-machining qualities of Ostuco tubing that give us extra savings in set-up time and tool grinding costs . . ."

These actual figures, from an eastern manufacturer, indicate the machining economies Ostuco Forged Tubing can effect in your product. The starting point is to call your nearest Ohio Seamless office, listed in the Yellow Pages, or the plant at *Shelby, Ohio — Birthplace of the Seamless Steel Tube Industry in America.*

AA-8850

Be sure to visit Booth 205
Design Engineering Show
May 25-28, Philadelphia

OSTUCO TUBING

OHIO SEAMLESS TUBE DIVISION

of Copperweld Steel Company • SHELBY, OHIO

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

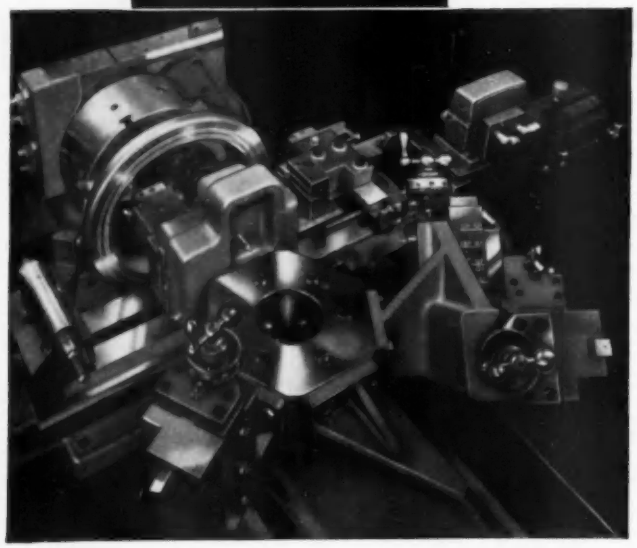
SALES OFFICES: Birmingham, Charlotte, Chicago (Oak Park), Cleveland, Dayton, Denver, Detroit (Huntington Woods), Houston, Los Angeles (Lynwood), Moline, New Orleans (Chalmette), New York, North Kansas City, Philadelphia (Wynnewood), Pittsburgh, Rochester, St. Louis, St. Paul, St. Petersburgh, Salt Lake City, Seattle, Tulsa, Wichita CANADA: Railway & Power Engr. Corp., Ltd. EXPORT: Copperweld Steel International Company, 225 Broadway, New York 7, New York

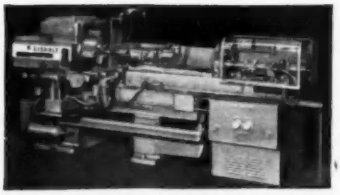
YOUR PARTNER in PRODUCTION

Your Gisholt Representative can save you time and help you make more money. Call him when you make your next estimate.

Got a new job coming up? Are you sure you're down to rock-bottom costs? Using the smartest setup? Combining all possible operations? Making the most of new accessories and machine features?

Your Gisholt Representative can tell you. He's an authority on the newest tooling methods and production techniques. He's a member of the Gisholt "Round Table"—a staff of specialists in machining problems who have helped hundreds of manufacturers find ways to lower costs. He's ready to help *you*—without cost or obligation. Call your Gisholt Representative today. Or write us.





A typical example of your Gisholt Representative's cost-cutting ideas

Above, a Gisholt MASTERLINE NO. 3 Ram Type Turret Lathe with hydraulic drive has become a rugged, low-cost automatic chucking lathe—but it still retains the versatility and quick setup of a hand-operated machine.

For example, the setup at left is handled by a female operator. Adjustable tooling permits machining 14 steel stamping sizes, ⅜" to 2-15/32" width, 3¾" to 15¾" diameter, with minimum change-over. In one automatic cycle a typical part, 15¼" diameter, is completely machined (14 surfaces) in just 3.30 minutes f.t.f. With minimum investment, the new ram type lathe with hydraulic drive lowered production costs and provided automatic chucking turret lathe efficiency.

For complete information on the Hydraulic Drive, ask your Gisholt Representative or write for Form 1182.

GISHOLT

The Gisholt "Round Table" represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

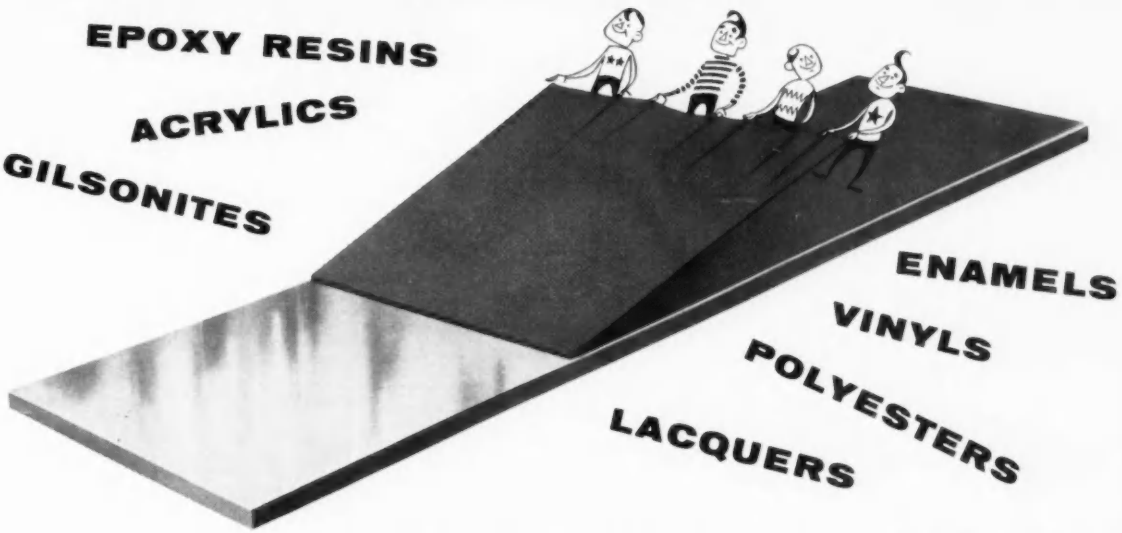
Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines
• Factory-Rebuilt Machines with New-Machine Guarantee

Another new development from Detrex:

A New Line of Paint Strippers- One For Every Stripping Need!



Recover all of your rejects—improve overall production.

Depend on Detrex for every Metal Cleaning and Processing need

- PERM-A-CLOR NA (Trichlorethylene)
- Solvent Degreasers
- Ultrasonic Equipment
- Industrial Washers
- Phosphate Coating Compounds
- PAINTBOND Compounds
- Aluminum Treating Compounds
- Alkali and Emulsion Cleaners
- Rust Proofing Materials
- Extrusion and Drawing Compounds
- Spray Booth Compounds

World's Largest Exclusive Producer of Cleaning Chemicals and Equipment

The Detrex Research Department, long aware of the fact that no single stripper can efficiently remove all varieties of paints, has developed a line of strippers that guarantee superior results on the paints for which they were developed.

Your Detrex service engineer is your professional consultant. You can't afford to pass up his expert analysis of your stripping operation that includes; laboratory analysis of the paint you are using, type of equipment available to do the job and your allowable stripping time.

You can be assured, the proper analysis and recommendation will result in important savings and superior stripping in every case.

DETREX CHEMICAL INDUSTRIES, INC.

Box 501, Dept. AI-459, Detroit 32, Michigan

Circle 112 on Inquiry Card, for more Data

CALENDAR

OF COMING SHOWS AND MEETINGS

SAE National Aeronautic Meeting, Production Forum, and Aircraft Engineering Display...Mar. 31-Apr. 3

International Automobile Show, Coliseum, New York, N. Y...Apr. 4-12

American Chemical Society, national meeting, Statler Hilton Hotel, Boston, Mass.....Apr. 5-10

Nuclear Congress and Atom Fair, Cleveland, O. .....Apr. 5-10

AWS Annual Technical Meeting and Welding Exposition, International Amphitheatre, Chicago, Ill. .....Apr. 7-9

Sixth Annual Industrial Engineering Conference, Purdue University, Lafayette, Ind.....Apr. 13-14

American Management Association, 28th national packaging exposition, International Amphitheatre, Chicago, Ill. .....Apr. 13-17

AFS Castings Congress and Engineered Castings Show, Hotel Sherman, Chicago, Ill.....Apr. 13-17

SAE Central Illinois Section, 10th Annual Earthmoving Industry Conference, Pere Marquette Hotel, Peoria, Ill. .....Apr. 14-15

Conference on Industrial Instrumentation and Control, sponsored by Armour Research Foundation and Institute of Radio Engineers, Illinois Institute of Technology, Chicago, Ill. .....Apr. 14-15

ASTE Annual Meeting, Schroeder Hotel, Milwaukee, Wis.....Apr. 18-22

Metal Powder Industries Federation, annual meeting and Powder Metallurgy Show, Detroit, Mich. .....Apr. 20-22

ASLE Annual Meeting and Lubrication Exhibit, Hotel Statler, Buffalo, N. Y.....Apr. 21-23

Lead Industries Association, annual meeting, Drake Hotel, Chicago, Ill. .....Apr. 22-23

Association of American Battery Manufacturers, annual convention, Americana Hotel, Miami Beach, Fla. .....Apr. 22-25

American Zinc Institute, annual meeting, Drake Hotel, Chicago, Ill. .....Apr. 23-24

National Chamber of Commerce, annual meeting, Washington, D. C. .....Apr. 26-29

ASME Metals Engineering Div. Conference, Albany, N. Y. Apr. 29-May 1

ASM Southern Metals Conference, Augusta, Ga. .....May 4-6

National Industrial Production Show, Toronto, Canada.....May 4-8

Industrial Waste Conference, Purdue Univ., Lafayette, Ind....May 5-7

World Car Show '59, Roosevelt Raceway, Westbury, L. I., N. Y. May 8

Society for Experimental Stress Analysis, spring meeting and exhibition, Sheraton Park Hotel, Washington, D. C.....May 20-22

American Society for Quality Control, annual convention and exposition, Hotel Sheraton, Cleveland, O. .....May 25-27

ASME Design Engineering Show and Conference, Convention Hall, Philadelphia, Pa.....May 25-28

PROJECT ALERT AT WORK FOR YOU

FIRST: Udylite introduced its plating barrel reconditioning and replacement plan. It has worked and is working, just as promised, for the many customers who have taken advantage of this service.

SECOND: Udylite offered an unmatchable service for modernizing old rectifiers to give them the benefit of the latest high efficiency rectifier developments.

THIRD: *Now,* Udylite offers a *no charge* technical service for the inspection of your Udylite Full Automatic machines and the recommendation of what is needed to put them in top operating conditions.

THE PLAN AND THE PROMISE:

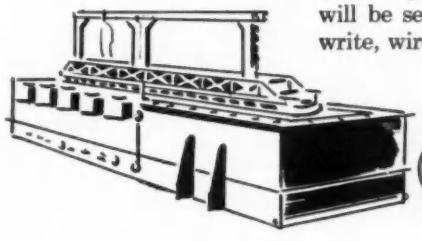
Your Udylite representative will call on you and offer this special service:

1. A factory-trained service man will call at your plant, at your convenience, to determine if your machines need service and/or parts.
2. If they are needed, he will give you, *at that time,* a quotation at the special low prices established for this Project Alert program.
3. On your acceptance of the quotation, parts will be shipped promptly from a special department at Udylite. When they arrive at your plant, the Udylite service man will return and supervise your people in their installation.

THE ADVANTAGES:

1. Complete machine inspection without charge to you.
2. Immediate and complete quotation, if work or parts are needed.
3. Udylite factory supervision in your plant.

All three Project Alert plans are working. And all their advantages are yours for the asking. Your Udylite man will be seeing you soon. But if you need prior service, write, wire or call us *today.*



the udylite corporation

detroit 11, michigan • world's largest plating supplier

News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

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Ford, Chrysler Finally Admit That Small Car Is Coming Out

Ford and Chrysler finally have admitted something that Detroit and the nation have known for many months—the Big Three will market small American-made passenger cars within a year, and probably within eight months.

The Ford admission, which came in a March 10 letter to stockholders, was straightforward: "Barring changes in the market and other circumstances, the company plans to introduce such a car during the 1960 model year. If introduced, the car will be in competition with other economy cars, including cars expected to be produced in this country by other American manufacturers."

The statement accompanied Ford's annual report and was signed by both Henry Ford II and Ernest R. Breech.

The Chrysler admission, which came only one day before Ford's, was not quite as direct, but it did reveal more details.

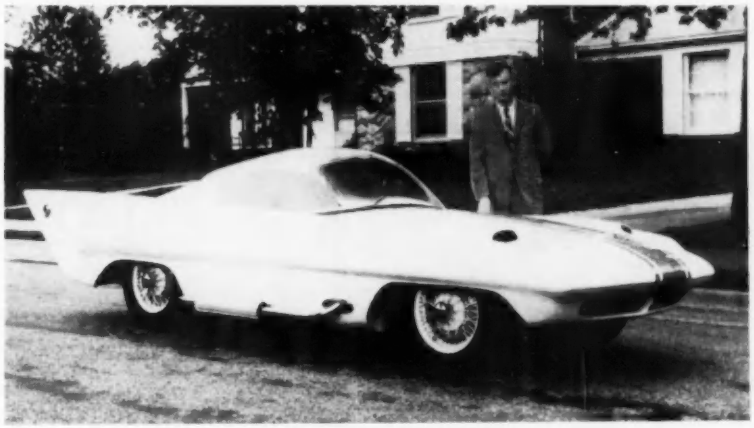
L. L. Colbert, Chrysler president, said his company would introduce a small car if competition led the way.

Colbert said that Chrysler did not want to be first, but "we'll come right along." He told a press conference that Chrysler could have its car on the market before the end of this year.

Following the Ford and Chrysler statements, it remained only routine formality for General Motors to announce its intention to produce a small car this year.

If both Ford and Chrysler have decided the market warrants action, it is logical that GM's market research staff and top executives have reached the same conclusion. The market, in fact, seems to be as solid as ever, with both Rambler and Studebaker Lark sales still climbing.

Actually, GM is expected to be first on the scene with its small car (see AI March 1, p. 11).



SPORTS CAR REFLECTS TOMORROW'S STYLING

A new look in automotive styling is demonstrated by this sports car. The body is of a special plastic construction with a plexiglass bubble canopy over the passenger compartment. Car was built at a cost of about $2500 by Virgil M. Exner, Jr., son of Chrysler Corp.'s director of styling. Each body panel consists of 16 coats of epoxy resins laminated separately between as many layers of fiberglass cloth. The epoxy resin was supplied by Ren Plastics, Inc., Lansing, Mich.

Meanwhile, all three companies have appointed advertising agencies to handle the small car accounts, and programs are in the preliminary planning stages. Campbell-Ewald will handle the small Chevrolet, J. Walter Thompson the Ford, and Leo Burnett Co. the Chrysler entry.

Elsewhere, Rhys M. Sales, president of Ford Motor Co. of Canada, reported that his company has made preliminary moves which would permit production of an economical car in Canada. The final decision, he said, will hinge on whether such a car is placed in production by Ford Motor Co. in the U.S. as well as on market conditions in Canada.

AMC Will Put Nylon Bushings On Steering Ball Joints

American Motors will make a running change this Spring to new steering linkage ball joints with nylon bushings. The ball joints will go first on the Rambler Rebel V-8, and they will be standard on all Rambler cars in 1960, according to R. H. Isbrandt, director of automotive engineering.

The new ball joints are permanently lubricated and sealed. Isbrandt says this is the first such application in the automotive industry. Other companies are expected to follow with the nylon bearing joints in 1960.

Rambler made another running change earlier this year—this to a chrome roof-top travel rack for the Rambler American Super station wagon.

The travel rack (at no extra price) will increase the "family tie" of the American wagon with its 108-in. and 117-in. wheelbase counterparts, according to AMC's Roy Abernethy.

Air conditioning also is being offered as a dealer-installed option for 1958 and 1959 Rambler American models.

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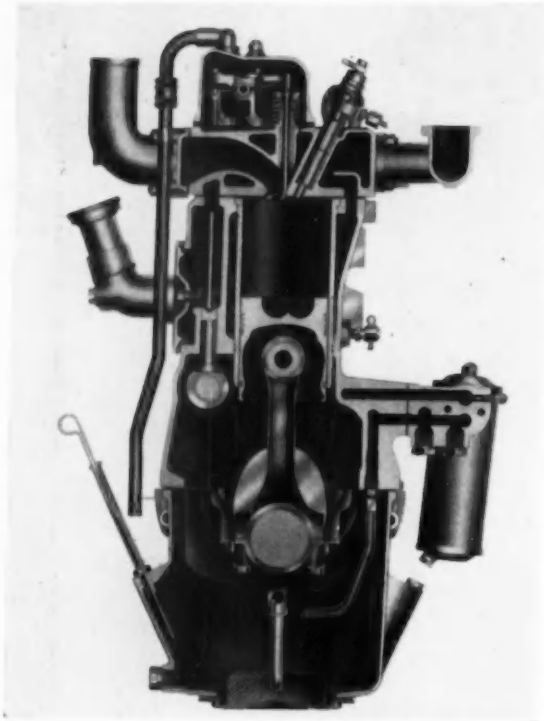

DIRECT INJECTION

Direct injection is used for the first time by F. Perkins Ltd. of Peterborough, England, in a new medium-speed Diesel engine. The four-cylinder unit, designated Four 270D, has a 4.25-in. bore and 4.75-in. stroke and a 269.5 cu in. displacement. With a compression ratio of 16 to 1, it develops a maximum of 62 bhp at 2000 rpm for farm applications. Torque is 189 lb/ft at 1000. Toroidal combustion chambers are recessed in the piston crowns, and both these and the four-hole injectors are slightly offset from piston centerline. Valves are operated by low-level camshaft positioned to facilitate installation of ptos for agricultural and industrial use.

Ford Approaches "One Body" Concept With Its 1961 Cars

Ford Motor Company will take another step closer to the "one body" concept with its 1961 lines of passenger cars. Variations of this concept currently are in use at Chrysler and General Motors.

There are no changes planned in the current body alignment at Ford for 1960, although there will be an additional body with the introduction of Ford's economy car. Ford and Edsel's full-size cars will have a new common body; and Mercury, Lincoln, and Thunderbird will continue with the same units they have now.

But 1961 will bring a big change. According to one report, Ford plans to have only three bodies in 1961, including the small car and the Thunderbird.

Here is the way the line-up looks for 1961: The Small Ford and Edsel B will share one body. Ford, Mercury, and perhaps the Lincoln models, with the exception of Continental, will share a single body, with Continental on a scaled-up Thunderbird body.

But there is a strong indication that Continental, either on its present body or the larger Thunderbird shell, will be the only Lincoln model offered in 1961. Prospects are best that Continental and the Thunderbird will share the same unitized shell and the same assembly plant.

Chrysler Corp. went to the single-body plan with its 1957 line, then later split off Imperial as a separate car. In 1960 and probably 1961, Imperial will continue to use its own body and frame, while the other four corporation cars go to a unitized type of construction.

General Motors has a single body in 1959 and will continue this set-up unchanged in 1960, except, of course, for its new small car. GM cars for 1960 will have extensive sheet metal changes below the beltline, but the basic shell will not be altered.

Midland-Ross To Close Plant; Chrysler Will Make Own Frames

Midland-Ross Corp. will close its Detroit plant at the end of Chrysler's 1959 model run, and Chrysler will make its own passenger car frames beginning with 1960 model production.

Midland-Ross is falling victim to a pair of significant developments in the automobile industry. The first is a general trend within recent years towards integration of manufacturing operations by the automobile makers themselves.

The second is Chrysler's plan to switch to a form of unitized construction for its 1960 Plymouth, Dodge, DeSoto, and Chrysler passenger cars.

The integration trend showed up in another form earlier this year, when Chrysler began operations at its newly-formed Electrical Div. in Indianapolis. In January, production of automotive distributors began. Manufacture of other electrical items will begin later.

Chrysler will use a stub frame for its 1960 passenger car body shell, with the front end sub-assembly bolted to the firewall. The sub frame will be manufactured by Chrysler in its own plants, probably on Mack Ave. or Kercheval in Detroit.

The frame fabrication thus would be an integral part of body stamping.

Dodge truck frames, currently produced at the Midland-Ross plant in Detroit, will be built in Cleveland beginning next summer. Imperial will continue to receive both frame and body from Budd Co., and construction will not be unitized.

The Midland-Ross closing will idle about 1200 employes on Detroit's highly industrial East Side. The firm earlier had announced a partial cutback at the end of '59 output, but had hoped to be able to keep the plant in operation.

The specialized presses, welding and fabricating equipment most likely will be offered for sale to Chrysler next summer.

New Detroit Firm Making Graphite Lubricating Aid

King Graphite Product, Inc., a newly-formed corporation in the Detroit suburb of Trenton, is producing a graphite lubricating fortifier which is said to give longer life to machine tools, cutting tools, air compressors, conveyor systems and other equipment.

Known as KGP, the fortifier is a synthetic colloidal graphite of particle size permanently suspended in a neutral oil carrier for use with lubricants. It can be blended in other carriers for specific purposes.

King says its new fortifier can provide lubrication in high temperatures that rapidly would consume ordinary oil and grease.

Power Group in Small GM Car Will Form Single Assembly

There has been a great deal of talk about Chevrolet's air-cooled aluminum rear-mounted engine for its upcoming small car, but very little about the suspension and power train systems that such an engine would require.

Here is the way the power group in Chevrolet's small car shapes up, according to latest reports:

The engine, differential and transmission are a single sub-assembly, with the engine the rearmost member of the unit. The transmission is mounted to a rigid cross member, which in turn is bolted at four points to the under body of the car.

This makes the differential, located between engine and transmission, rigid. So Chevrolet will employ a double swing axle, with both right and left sides free to move on universal joints mounted to the differential case.

"A" frames, which anchor the coil springs, control the swing axles in their vertical travel. These "A" frames are located at the two ends of the same cross member to which the transmission is mounted.

Engine power feeds to the transmission through a non-concentric shaft which goes through the differential housing but above the gears.

The car, incidentally, will offer three-speed manual transmission as standard equipment and a lightweight version of the Powerglide two-speed automatic as optional equipment.

If optional automatic transmission is used, the torque converter becomes a part of the power sub-assembly, located between the engine and differential.

Chevrolet's front-end suspension and steering mechanism will be similar, if not identical, to the 1959 Chevrolet system. The bulk of the system will be mounted forward of the center line of the front wheels.

At Chevrolet's small car final assembly plants, the engine, differential and transmission will be joined on a sub-assembly line feeding into the final line.

Shell Begins Production Of New Synthetic Rubber

Shell Chemical Corp. has started producing a synthetic rubber said to be as tough and durable as the natural variety and just as cheap.

The new material, known as polyisoprene, is already being used by the United States Rubber Co. in the production of truck tires, which normally are made of tree-grown rubber.

Top officials of both companies pointed out that the new product could make the U.S. independent of foreign rubber in times of emergency. Until now, natural rubber has been preferred to synthetic for truck, bus, and airplane tires because the heat build-up is not as great in natural rubber under heavy loads.

John H. McGovern, U.S. Rubber president, said that company scientists have developed new compounding techniques that shorten the curing time of the new rubber, give it better adhesion, and adapt it to normal tire building operations.

For the present, he reported, polyisoprene tires are being produced in the company's Los Angeles plant in the 7.50-20 size used by small trucks. The company plans to extend its facilities, however, to produce other sizes for trucks, off-the-road vehicles, aircraft, white sidewalls for passenger cars, and other products now requiring natural rubber.

Shell Chemical will manufacture and sell the new material under the trade name Shell Isoprene rubber. It is currently being produced at Shell Chemical and Shell Oil Co. plants in Los Angeles at a rate averaging five tons a day. Output will be stepped up to an annual rate of 15,000 to 20,000 tons, however, as present plant facilities are expanded, Shell said.

"UNIGLAS" ASSEMBLY SPEEDS MAINTENANCE

A new unitized fiberglas hood, fender, and radiator shell assembly known as "Uniglas" speeds maintenance and repair work on engine and cooling system. The new assembly, built by Kenworth Motor Truck Co. for its drop-frame, front-end conventional truck models, can be raised manually by the mechanic or driver without help, or it can be lifted clear of the truck by two men.

Fargo Wagon To Be Offered By U. S. Dodge Car Dealers

The Fargo Town Wagon, until now strictly a part of the Dodge truck export line, will be offered to U. S. customers through Dodge passenger car dealers.

The 108-in. wheelbase wagon has been modified slightly for the domestic market, but it still is similar to the Town Wagon sold in this country through truck dealers.

Although it is about the length of a Rambler station wagon, the Town Wagon cannot be put in the small car class because of its panel truck height.

The Fargo wagon is offered with either six-cylinder or V-8 engine, power steering and power brakes. It is an eight-passenger wagon, and removable seats provide some 120-cu ft of cargo space.

General Motors Gets Award For Safety Record in 1958

General Motors has received a National Safety Council award for a new on-the-job safety record in 1958. During the year, only 0.2 per cent of GM's hourly-rated and salaried employes in the U. S. and Canada lost time from work accidents or occupational illness. GM had 1.04 disabling injuries per million man-hours worked, and lost 151 days per million hours worked.

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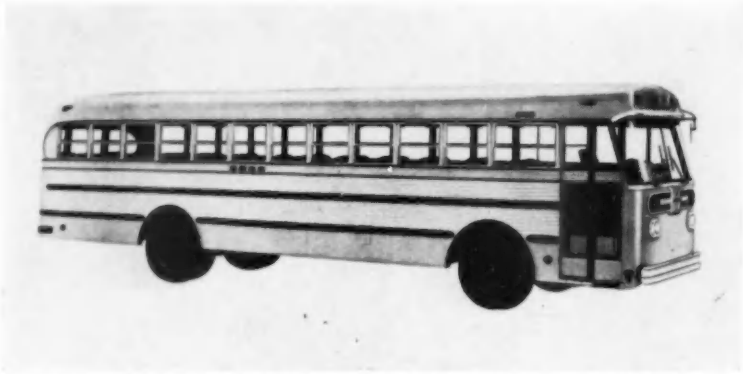


NEW SCHOOL BUS FEATURES IMPROVED REAR VISION

Better rear vision is featured on this new school bus built by Superior Coach Corp., Lima, O. Larger windows in the rear extend clear around the bus sides, giving the driver a much safer view of the road and traffic behind his bus. Superior Supercruisers are available with rear or forward power, and in 72 in. and 76 in. inside headroom models, seating from 61 to 79 passengers.

Automobile Industry Girding For Steel Strike This Summer

The automobile industry is preparing itself for a general steel strike this summer by stockpiling steel and requesting suppliers to do the same.

There is strong feeling in Detroit that there will be a strike of at least two months' duration. Steel buyers see the signs as the steel companies and union draw their battle lines. One Detroit labor expert says "every law of logic points to a strike."

Car makers are building inventory to carry them through 1959 model production and, in some cases, into 1960 production. Ford and Chrysler have sent out the word for suppliers to be prepared to ship components several months beyond the July 1 strike deadline.

Meanwhile, steel orders have been climbing and output has been high. Some steel makers complain they have not been able to build inventory during the winter months because orders have taken up all their production.

White's 1958 Earnings High, But Mack Sales, Net Drop

White Motor Co. reported record sales and earnings for 1958, while Mack Trucks, Inc. saw its business drop during the year.

Both companies reported a pick-up in orders during the latter part of 1958 and early months of 1959. Officials of both companies see an improvement in commercial orders offsetting a cutback in government business.

White's sales totaled $269 million, up from $225 million in 1957, the former record year. Earnings totaled $7.1 million, up from $6.8 million the year before and about $3,400 above the 1956 high. White's 1958 figures include nine months of Diamond T operations and the first full year of Reo operations.

Mack's sales totaled $253.7 million, a drop of about $10 million from the previous year. Earnings amounted to $7.7 million, below the 1957 total of $11 million.

Ford Develops New Tools Made of Tungsten Carbide

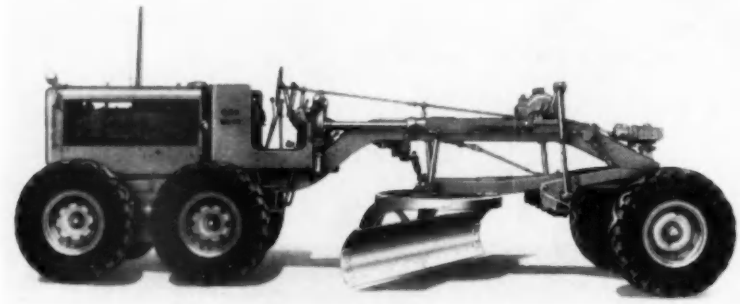
Ford Motor Co.'s Scientific Laboratory announced it has developed titanium carbide tool bits that outwear tungsten carbide and ceramic tools in semi-finish and finish machining operations.

Dr. Michael Ference, Jr., director of the laboratory, said the development could make the United States independent of foreign tungsten.

Dr. Ference classed the new titanium carbide tools as "probably the most successful cermets to be produced since the development of tungsten carbide."

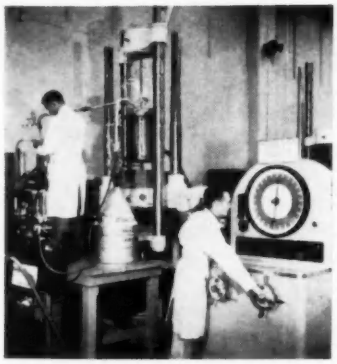
Normal composition of the tool bits developed for steel cutting is 80 per cent titanium carbide, plus 10 per cent each of nickel and molybdenum, both of which are used as bonding agents. Tool bits have a hardness range of 90 to 93 on the Rockwell A scale. Other combinations are being studied for possible use in rough machining operations as well as on operations with interrupted cuts.

Laboratory testing of the new tools is under the direction of Dr. Michael Humenik, Jr., supervisor of the



NEW GRADER POWERED BY TURBOCHARGED ENGINE

New Caterpillar No. 14 Motor Grader is described as the first vehicle of its kind to be equipped with a turbocharged engine. Rated at 150 hp, the engine is designed to provide an 18 per cent torque rise, allowing the unit to respond quickly and powerfully to heavy loads. Transmission provides six forward speeds and two reverse. Forward speeds range from 2.6 to 21.6 mph. Vehicle weighs 29,280 lb and has a 230-in. wheelbase.



COLD-TEST CHAMBER

This cryogenic chamber built by Boeing structural test engineers tests materials at temperatures close to absolute zero. Outside jacket consists of stainless-steel shell with inner lining of urethane plastic foam insulation. Inside the jacket are two vacuum chambers with a liquid-nitrogen chamber between them and a stainless steel test chamber into which liquid helium is forced. Cold chamber with temperatures as low as minus 450 F is used for both tensile and fatigue tests.

ceramics and powder metallurgy group that developed them.

Laboratory officials are confident that the new tools can compete in cost with tungsten carbide and ceramic tools, citing the fact that titanium carbide enjoys about a 3 to 1 advantage over tungsten carbide on the basis of specific gravity alone.

Willys Will Build Renault In Brazilian Jeep Plant

Willys-Overland do Brasil will build the French Renault Dauphine passenger car in its Jeep plant in Sao Paulo, Brazil. By the end of 1960, the Latin American affiliate of Willys Motors expects to have a production rate of 50,000 Dauphines a year.

Willys and Renault will invest $12 million in machinery and equipment for the new project. Additional financing will come from common stock issued in Brazil. First shipments of machinery will begin soon.

Willys also is tooling to build its own passenger car in Sao Paulo later this year. Jeep and Willys production this year will total about 30,000, but additional facilities to be installed later in 1959 will double the capacity.

Willys-Overland do Brasil will manufacture 95 per cent of the Dauphine, by weight, including engine, axles, transmission and body.

Tooling and production equipment will come from the United States, France, Germany, Britain, Italy, Holland, Belgium and Switzerland, making the Brazilian Renault venture truly international in scope.

TABLOID

Tiny electronic tubes one-fifteenth the size of the smallest general-purpose tubes now in use have been introduced by the Radio Corp. of America. Called Nuvistors, the new tubes are claimed to outperform transistors in some applications. Temperature range: from minus 320 F to 350 F.

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A giant radiography machine that can detect interior flaws in steel up to 12 in. thick has been installed at the stainless steel foundry of Cooper Alloy Corp., Hillside, N. J. The new unit, built by Picker X-Ray Corp., uses tiny wafers of Cobalt 60 as a radiation source. Called the Picker Cyclops, the machine is being used to inspect valves, fittings, and castings, Cooper said.

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Refractomet Div. of Universal-Cyclops Steel Corp. now is producing columbium mill products for nuclear applications and for possible use for leading edges, nose cones and skin material on supersonic vehicles.

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Retained austenite in amounts up to 10 per cent lowers the fatigue strength of high-strength steels, according to National Bureau of Standards. Recent tests on four low-alloy steels (carbon content: from 0.44 to 1.06 per cent) showed that fatigue stressing changes retained austenite to untempered martensite, which may account for the damaging effect, the NBS report stated.

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A new acrylic-type thermoplastic polymer that combines high-heat resistance, stiffness, and toughness has been announced by J. T. Baker Chemical Co. The new plastic, designated PL-12, has a heat distortion point of 240 F, a flexural modulus of 415,000 psi, and a notched izod impact strength of 1.0 ft lb/in., Baker says.

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Chance Vought Aircraft Research has developed a new type of hydraulic O-ring seal that it says may eliminate the need for anti-extrusion devices at high temperatures. Further development of the new seal, which has a spring insert concentric with the O-ring, is now in progress under an Air Force contract.

Monsanto Chemical Co. is marketing a new low-cost all-synthetic hydraulic fluid which it describes as a "formulated compound based on halogenated hydrocarbons." The new fluid, designated Pydraul A-200, is said to be the first of its type to be developed for fire-resistant use in hydraulic systems. Properties claimed: extreme fire-resistance, excellent lubricity, and compatibility with other commercially available hydraulic fluids of the all-synthetic type.

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Modular panels of rigid urethane foam provide good insulation for truck trailers and cut heat loss, says National Aniline Div. of Allied Chemical. Other advantages claimed: urethane-filled panels have low moisture pickup, withstand temperatures of 250 F without deterioration and urethane can be molded, sprayed or foamed in place.

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A velocity measuring system that is capable of measuring the speed of a supersonic sled to an accuracy of one part in 278 million is now under development by Computer Equipment Corp. To do this, CEqC engineers have devised electron counting circuits that will measure with accuracy the time it takes light to travel one foot. Hence, the term "light foot," which in electronic timing language is equivalent to millimicrosecond, or one-thousandth of a millionth of a second.

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Navy has successfully tested a new type of movable nozzle made of molybdenum that it says improves the steering control of the Polaris missile. The nozzle was designed and manufactured by Cleveland Pneumatic Industries.

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Honeycomb sandwich panels for aircraft and missiles now can be bonded by a quartz lamp radiant brazing system, according to Armour Research Foundation. The new brazing system, which was developed by ARF for Twin Coach Co. and Grumman Aircraft, cuts the cost of producing honeycomb panels by speeding up the brazing cycle, says ARF.

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CONVAIR 600 "KNEELS" TO LOADING HEIGHT

Artist's sketch shows proposed cargo version of Convair 600 with its tail swung aside for loading. To achieve fast loading and unloading, the main landing gear would "kneel" bringing the aft cargo deck down to ordinary truck bed height. When loaded, the landing gear would extend to normal position, leveling the craft for takeoff. Convair 600 is built by Convair Div. of General Dynamics Corp. at San Diego.

Allison May Build Rolls-Royce Jet Engine in Indianapolis

Allison Div. of General Motors may build the Conway jet engine at its Indianapolis plant under license from Rolls-Royce, Ltd., of England. Reports have linked the two engine manufacturers, but no confirmation has come from either side.

Asked about the reports, an Allison spokesman said the two firms have "visited" each other and discussed possibilities of some sort of cooperative effort. He pointed out, however, that there is no agreement for any license or marketing arrangement of a Rolls-Royce engine by Allison.

Allison builds a turboprop engine. The Rolls engine mentioned is a Conway turbofan, or bypass engine.

Reo Has New 185-Hp Engine, Power Take-Off for 1959

Reo Div. is offering a heavy-duty engine and a flywheel power take-off unit among the new features of its 1959 truck line.

The six-cylinder engine features a new cooling system that increases coolant flow by 50 per cent, at a rate of 90 gal per minute. Water enters the engine at two points, and nozzle jets direct the cooling flow at the valve seat areas.

The OH 185, with displacement of 362 cu in. and bore and stroke of 4.25, develops 185 hp.

A plate-type oil cooler, which maintains oil temperature close to coolant temperature, is standard on the new engine.

Reo recommends its new engine for tractor hauling in the 55,000 gcw range and for added performance in tandem work.

The power take-off offered by Reo is a unit built into the flywheel housing of the engine. As such, it is a factory-designed unit which is part of the chassis drive train. The location provides the same advantages as engine-front drive, without body and bumper modifications according to Reo.

Reo also is offering full flotation airplane-type tires for sand and other soft terrain in off-highway work.

Young Spring & Wire To Build Parts Plant Near St. Louis

Young Spring & Wire Corp. will build a new automotive parts plant in the St. Louis area as part of a $3 million expansion and modernization program. The plant will be completed in time for the beginning of 1960 model automobile production.

Young also will add to its Chicago parts plant, realigning and expanding facilities.

The St. Louis relocation will put Young in the neighborhood of Chrysler Corp.'s new assembly plant scheduled to open later this year.

Chevrolet Expands Flint Plant To Get Increased Truck Output

Chevrolet is adding 79,000 sq ft to the truck assembly area of its Flint plant to accommodate the growing trend toward "custom built" trucks.

Plant manager Thomas F. Schooley says the extra working area is needed because of the growing number of series, options, accessories and colors offered to truck buyers. The addition will provide working space as well as storage area for components.

Another reason for the expansion, which Chevrolet has not mentioned, is the fact that the former Willow Run truck assembly plant has been taken over for production of Chevrolet's small car beginning next fall.

The Willow Run truck operations were spread to several plants in the Middle West, including the Flint plant and the GMC truck plant in Pontiac.

The main part of the Flint expansion is the 44,000 sq ft extension of the present second floor to locate new paint spray booths and ovens. Spring, axle, and chassis lines will be rearranged and extended in a new 35,000 sq ft section. Additional storage space also will be available here.

Chevrolet expects the building to be completed by mid-July, with equipment installed by September.

Russian People Will See 23 American Cars at Exhibit

The Russian people—an estimated 3.5 million of them—will get a look at 23 new American automobiles at a special-constructed "Oogolok Amerika" next July in Moscow's Sokolniki Park. The exhibit, "Corner of America," will demonstrate the American way of life.

Featured will be one model each of the 1959 Chevrolet, Pontiac, Oldsmobile, Buick and Cadillac from GM; Imperial, Chrysler, De Soto, Dodge, Plymouth, and Dodge truck from Chrysler; Continental, Edsel, Ford and Thunderbird passenger cars; a Ford stake truck, two Mercury and two Ford station wagons; and Rambler and Studebaker sedans.

MEN IN THE NEWS

Timken Roller Bearing Co.—Paul J. Reeves was appointed vice-president in charge of sales; Robert C. Wingerter, director of sales; and S. T. Salvage, general manager of the Automotive Div.

Thompson Ramo Wooldridge Inc.—**Arch T. Colwell** has been named vice-president of engineering, research, and development.

Chrysler Corp.—**William C. Flaherty** has been appointed director of the newly created business research and market planning staff.

General Motors Corp., AC Spark Plug Div.—**Edward J. Brandl** was named director of fleet and industrial sales; **Harold L. Wardrop**, merchandising control manager; and **John A. Fellows**, coordinator of advertising and sales promotion.

Bendix Aviation Corp. — **Dugald Black** has been appointed vice-president in charge of industrial relations.

Dodge Div., Chrysler Corp.—**John W. Farley** was named Dodge field operations manager—west.

Wisconsin Motor Corp.—**Arthur J. Brown** was elected vice-president of manufacturing.

Fairchild Engine and Airplane Corp. — **Marion Maxfield** was made director of F-27 commercial sales.

Tube Reducing Corp.—**Richard L. Tannehill** has become vice-president in charge of Sales.

Pontiac Motor Div., General Motors Corp.—**John Z. De Lorean** was named assistant chief engineer in charge of advanced design, body, and paint trim sections.

Yale & Towne Mfg. Co., Materials Handling Div.—**Harry F. Rose** has been promoted to manager of crane and monorail sales.

Wyman-Gordon Co. — **Joseph R. Carter** was named general manager-Eastern Div. and **Robert E. Zell** general manager of the Harvey, Ill., plant.

Youngstown Sheet & Tube Co.—**Clarence E. Short** has become Minneapolis district sales manager and **Albert S. Harris** assistant manager, oil country tubular sales.

General Motors Corp., Radiator Div. — **Lawrence A. Zwicker** was named director of engineering and sales; **Frederic Ryan**, chief engineer; and **Bernard I. Raysor**, works manager.

Cessna Aircraft Co. — **Robert L. Lair** was elected a vice-president.

American Motors Corp. — **John Brookshire** has become planning superintendent at the Milwaukee Body Plant.

U. S. Steel Corp.—R. Daniel McMichael has been named assistant staff director of product information, public relations.

Tung-Sol Electric Inc.—Neil Uptegrove was named manager of advertising and sales promotion.

General Electric Co.—**Thomas J. March** has been appointed manager-sales for the Silicone Products Dept., succeeding **John T. Castles** who has become general manager of the chemical development operation of the Chemical and Metallurgical Div.

GMC Truck and Coach Div., General Motors Corp.—**T. L. Harris** was named western regional truck sales manager.

Chevrolet Motor Div., General Motors Corp.—**Sylvester J. Thrasher** has been promoted to director of quality control and **George A. Bundrett** succeeds him as quality control manager.

Eaton Mfg. Co., Axle Div.—**Thomas A. Frischman**, chief metallurgist, has also been named quality control chief.

Ford Motor Co.—**Edwin D. O'Leary** was appointed director of the organization and executive personnel planning office.

S-P Mfg. Corp.—**Richard E. Sutherland** was appointed sales manager.

Buffalo-Eclipse Corp., Buffalo Bolt Div.—**Eric G. Boehm** was named general manager.

Superior Coach Corp.—**G. L. Runkle** has been named vice-president of operations and **W. G. Lore** plant manager in charge of production.

Necrology

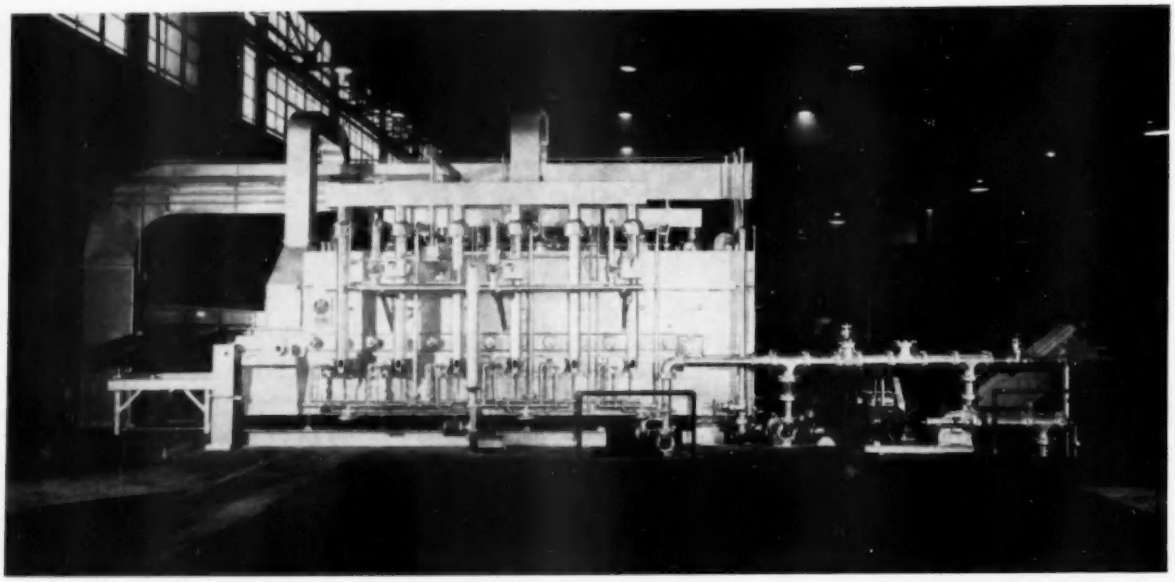
L. B. Turner, 55, Enjay Co. expert on polymers and plastics, died Mar. 5, at Louisville, Ky.

Paul Klain, 49, a group leader in the Metallurgical Laboratory of Dow Chemical Co., died Mar. 3, at Los Angeles, Calif.

Albert J. Dempsey, 65, vice-president of Crucible Steel Casting Co., died recently, at Milwaukee, Wis.

Arthur W. Anderson, 63, sales engineer for Borg & Beck Div. of Borg-Warner Corp., died recently, at Chicago, Ill.

Robert G. Patterson, 67, assistant to the president of Lamson & Sessions Co., died recently, at Pompano Beach, Fla.



Fuel-fired, radiant tube chain belt conveyor furnace is shown with automatic oil quenching equipment. The chain belt in this unit is 36 in. with a 1½ in. high side flange. Specified capacity is the decarb-free heating of 1500 lb per hour of steel bolts to 1600 F and oil quench (Electric Furnace Co.).

Latest Developments in Heat Treating for Automotive and Aircraft Fields

Added Labor Savings, Improved Quality Control, and Better Safety Characterize Modern Furnace and Induction Heating Installations

By
Andrew W. Shearer

PART I

THE automotive industry accounts *on the average* for at least 15 per cent of the total annual sales of heat processing furnaces. This percentage represents only a norm and will fluctuate from year to year as the industry's plans for capital expenditures relate to those of other industries.

Any attempt to estimate the dollar value of heating equipments installed in various industries is difficult. Aside from the broad range of types and sizes, individual values may run anywhere from $500 to $500,000. However, for purposes of this study, a reasonable estimate of the *average* dollar value of a furnace installed in an automotive plant would be $45,000.

Table I shows the numbers of furnaces installed in the plants of a representative cross-section of major automotive manufacturers as of September, 1958 (approx.). Their ages in the ranges of 0 to 5, 5 to 10, and 10 and over years are also given. If the grand total of 3488 furnaces owned by the seven companies listed is multiplied by a factor of $45,000 (estimated average cost), then this group alone has some $157 million invested in its furnace equipment.

Outside of the basic steel industry, the automotive industry heat treats more steel than any other single metalworking group. Heat treatments are carried out in a variety of furnaces, some quite specialized because of process requirements. The industry uses gas-fired furnaces predominantly, although electrically heated units are often employed for high-temperature op-

The first part of this three-part article will deal with industrial furnaces in automotive manufacturing applications; the second section will cover aircraft installations. The third part of the article will be devoted to induction heating as it applies to production operations in *both* industries. Dielectric heating equipment, used exclusively on materials that are non-conductors, does not properly fall within the scope of this discussion.

erations such as brazing and sintering. Industrial furnaces may be roughly divided into two general types—continuous and batch.

CONTINUOUS FURNACES

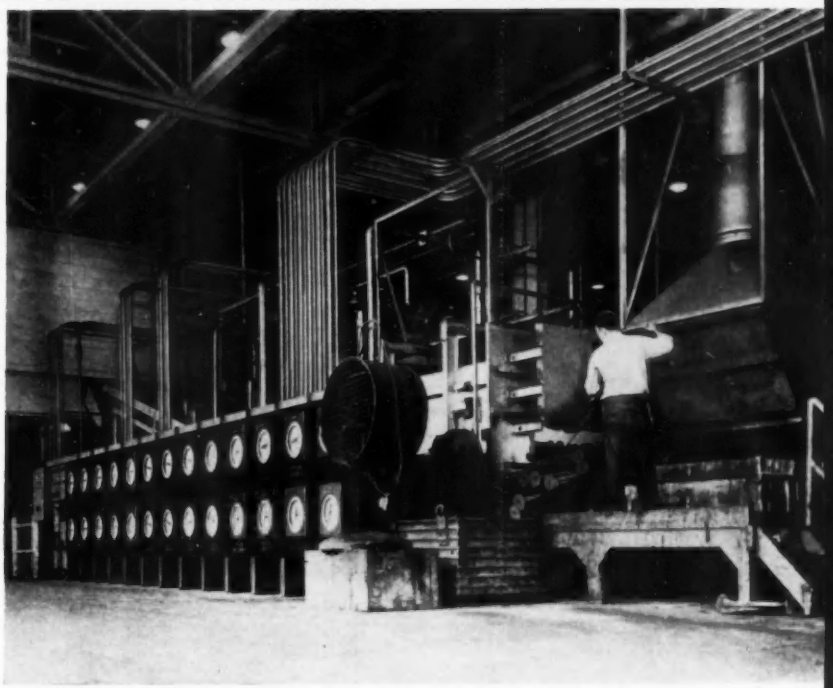
Roller Hearth

Work is conveyed through the furnaces directly on the hearth, or on trays, or in baskets which rest on the hearth. There are several types of roller hearths designed to meet different requirements:

1—ELECTRICALLY HEATED — permits very accurate atmosphere control (usually exothermic). Applications include: copper brazing pressed steel assemblies (automatic transmission parts); sintering powder metal parts (bearings, gears); and malleabilizing cast iron parts (jacks, pump elements). Forced circulation is used for such applications as stress relieving of rough machined parts and carbonitriding of bearing retainers.

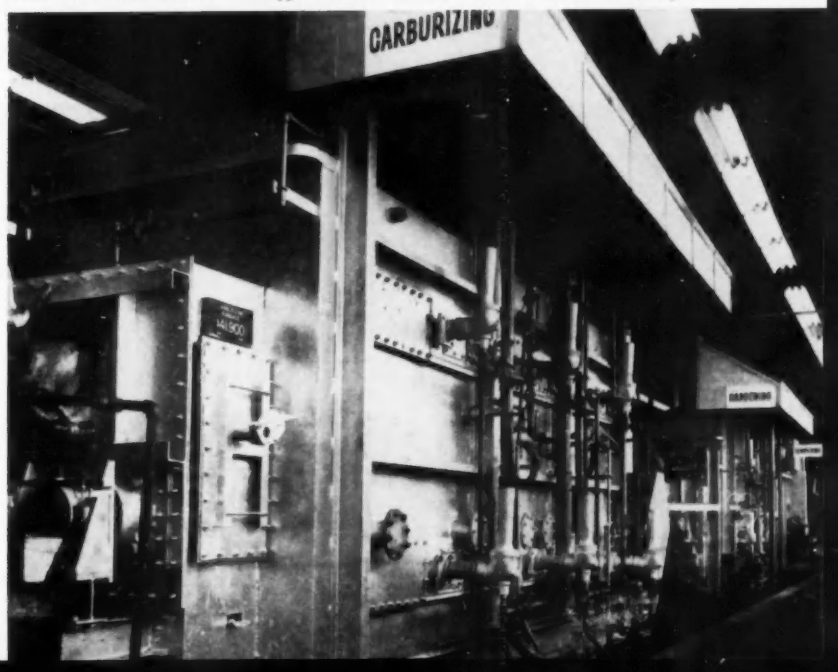
2—DIRECT GAS-FIRED — utilized for heating and cooling safety glass and molds for making curved glass components in an oxidizing atmosphere. Forced circulation is used in the lower temperature ranges for such applications as stress relieving steel weldments. In addition, direct gas-fired roller hearth furnaces are employed for annealing, normalizing, and hardening of numerous automotive products.

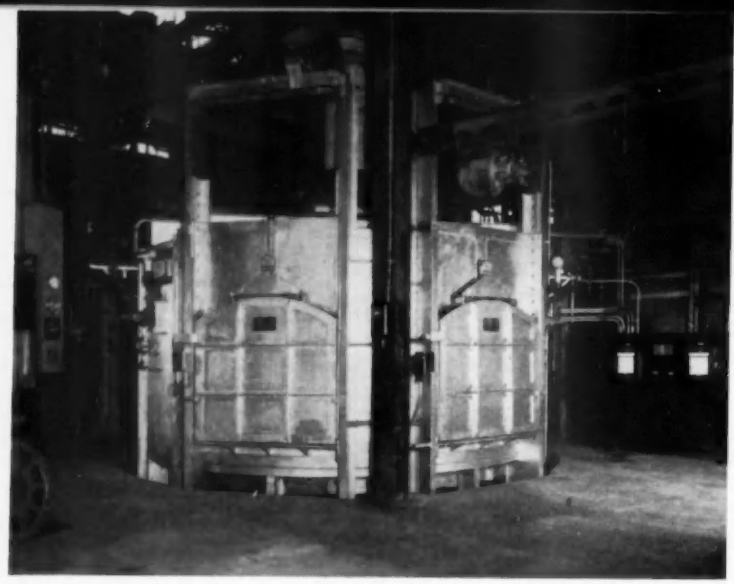
3—FUEL-FIRED, RADIANT TUBE—permits close atmosphere control for annealing of low carbon steel tubing and silicon steel laminations (automotive starter and generator equipment) in exothermic gas atmosphere; also used in combination with direct gas-fired preheat-

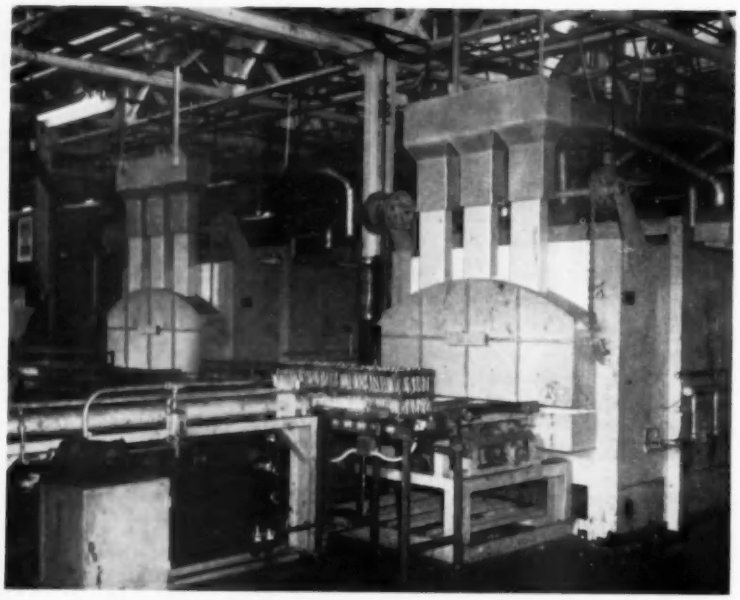


Panel-mounted ElectroniK potentiometers, with electric control which regulate zone temperatures in 10 different furnaces at the Canton, O., Forge Plant of Ford Motor Co. (Industrial Div., Minneapolis-Honeywell Regulator Co.).

Cups and cones are processed through carburizing, hardening, and tempering furnaces during heat treating at the Bucyrus, O., plant of The Timken Roller Bearing Co. Shown in the photograph is one line of the cone heat treating section. All furnaces are gas-fired, and the carburizing and hardening units are heated with suction-type radiant tubes (Surface Combustion Corp.).







ing equipment for heat treating, bending, and controlled cooling of safety window glass and molds.

4—COMBINATION FUEL-FIRED AND ELECTRICALLY HEATED — has radiant tubes for initial heating zones and electric heating for final heating and soaking zones; used in preheating, brazing, quenching, cooling, etc., operations, and for sintering powder metal parts; atmosphere often straight exothermic.

Chain Belt Conveyor

The conveyors on these furnaces consist of a moving hearth made up of flat-topped chain links assembled on through pins to form a belt of the desired width. This belt is driven over drums at each end of the furnace equipment. Directly under the discharge end drum a chute is placed to deliver the work into a quench tank.

1—FUEL-FIRED, RADIANT TUBE HEATED—used extensively for hardening operations involving "decarb-free" or carbon restoration work; atmosphere endothermic to prevent decarburization of steel. Work handled includes universal joint parts, shafts, bearing races, nuts, bolts, piston rings, etc. Direct-fired chain belt furnaces are extensively

Top—
This rotary hearth furnace is designed for heating large gears, sprockets, and wheels up to a temperature of 1750 F at a rate of 14,000 lb per hour. Burners are dual purpose and arranged to burn either oil or gas, or a mixture of the two. The furnace is part of a heat treat line which also includes a recirculating draw furnace and a batch-type draw furnace (Continental Div., Lindberg Industrial Corp.).

Middle—
This direct gas-fired continuous chain conveyor furnace at Chevrolet-Flint Div., General Motors Corp., is designed to precipitation-harden exhaust valves at 1400 F and requires a time at temperature of 14 hours; automatic charge and discharge are provided. Production rate is 3000 valves per hour for two furnaces with no atmosphere used other than the products of combustion (Lindberg Engineering Co.).

Bottom—
Eight horizontal muffle furnaces provide high heat treat production for a Michigan manufacturer of automotive and aircraft parts (Surface Combustion Corp.).

used for the heating for hardening of similar parts.

2—ELECTRICALLY HEATED — applications similar to those listed above for radiant tube types; not quite so suitable for carbon restoration work, due to carbon deposits from the hydrocarbon-enriched endothermic atmosphere gas grounding the heating elements; however, low voltage elements are now available to eliminate this problem.

Reciprocating (Shaker) Hearth

Reciprocating hearth furnaces, often called "shaker" hearths, are especially well suited to the heating of small items such as flat springs and washers. They are not adapted to work involving balls, cylinders, and other objects that roll. A reciprocating shaker hearth furnace can be heated by means of radiant tubes and indirectly heated by means of a muffle. When a muffle or radiant tubes are employed or the unit heated electrically, this type of furnace can be used for a controlled atmosphere.

Work moves through the furnace by means of short and abrupt hearth plate motions which can be regulated in speed, frequency and length to change the heating cycle. The charge is placed on the shaking loading platform and is finally dropped into a quenching bath. The mechanism which produces a correct shaking motion may be operated mechanically through an electric motor, hydraulically, or pneumatically.

Wire Mesh Belt Conveyor

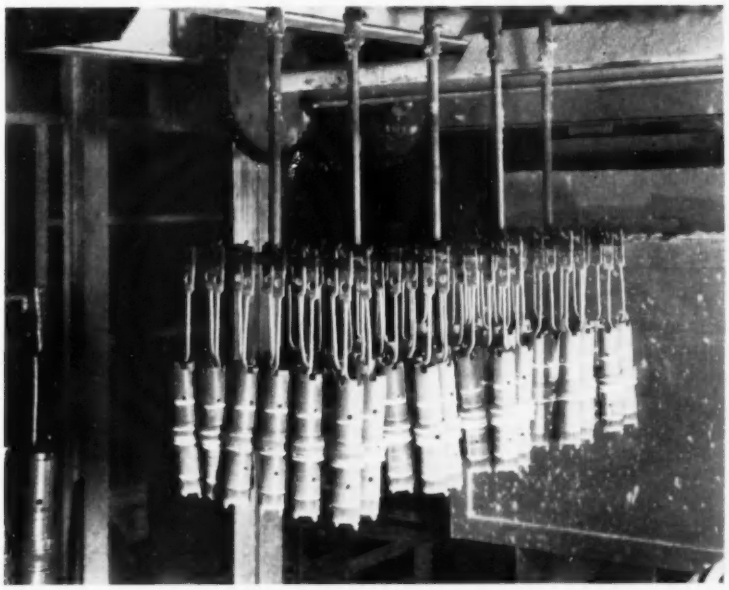
The work is generally conveyed through this equipment directly on the wire mesh belt. In some special cases, fixtures are used to support

TABLE I

TYPICAL AUTOMOTIVE FURNACE INSTALLATIONS

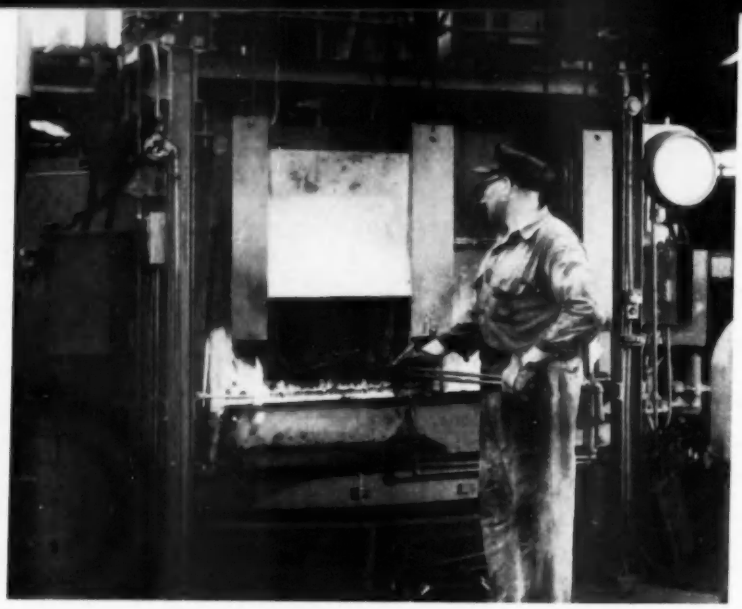
Manufacturer	Total	0-5 Yrs	5-10 Yrs	10 Yrs & Older
Buick	332	106	37	189
Cadillac	59	12	9	38
Chrysler Corp.	1930**	590***	590***	750
American Motors Corp.	73	0	2	71
Company X*	898	294	108	496
Studebaker-Packard Corp.	34	0	0	34
Oldsmobile	162	45	11	106
Totals	3488	1047	757	1684

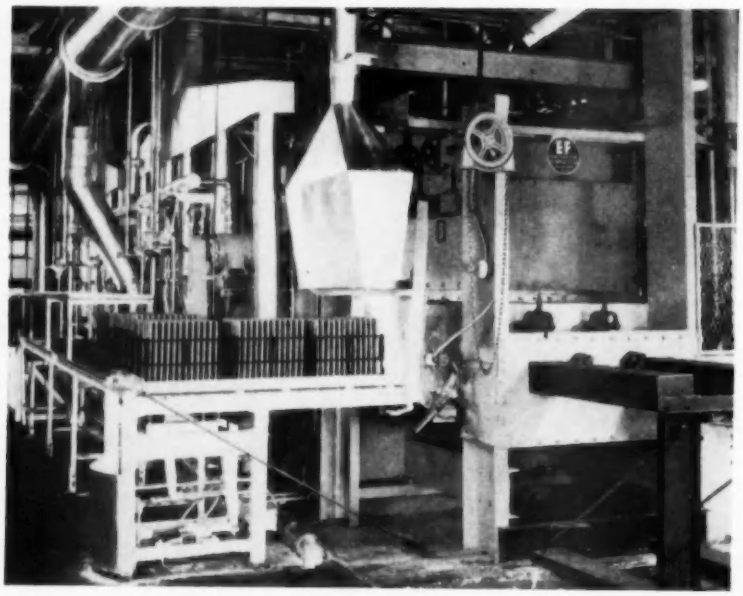
* Permission not given for identification.
** Includes induction heating units; no separate data furnished.
*** True breakdown of total 1180 units under 10 yrs. not available; division author's estimate.

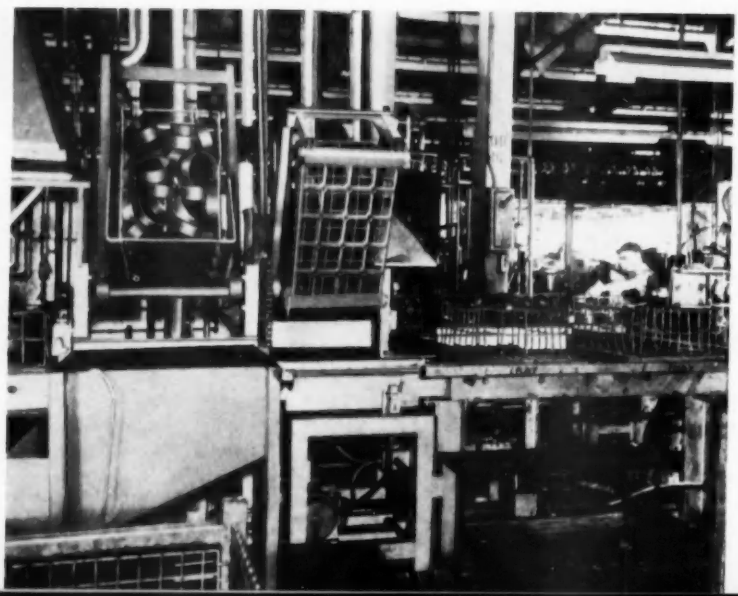


Top—
SAE-5040 automatic transmission stub shafts are fixtured for martempering and drawing in a 70-ft salt bath line. It is one of four similar lines installed in a large automatic transmission plant (Ajax Electric Co.).

Bottom—
A pit-type, electric Homo batch furnace is shown ready to receive charge of springs for tempering. Simple design of the furnace with short closed path for heat distribution combines with a precise temperature control system to eliminate high heat heads and overheating of elements (Leeds & Northrup Co.)







the work in the desired position on the belt.

1—ELECTRICALLY HEATED — major applications are for high temperature (1400 to 2050 F) brazing, sintering, and bright annealing of small automotive parts; atmosphere usually exothermic but may be endothermic if high carbon steel is being treated. Forced circulation is used in the lower temperature ranges for such applications as drawing after hardening of nuts, bolts, bearing races, cups, cones, etc., and heat treating of aluminum alloys.

2—FUEL FIRED MUFFLE TYPE—incorporates an externally heated alloy muffle through which the conveyor belt passes; adapted to high temperature brazing work where close control of the atmosphere is critical and malleabilizing. There are also many radiant-tube-heated types of wire mesh belt conveyor furnaces in use.

Pusher

The following group consists of furnaces through which the work is intermittently moved, generally by means of hydraulically operated cylinders. The work is usually conveyed on trays which rest upon rollers supported by alloy rails in

Top—
Operator loads 175-kw electric rotary hearth furnace used for hardening carburized gears at Caterpillar Tractor Co. Atmosphere is endothermic to prevent decarburization, and temperature range is 1400 to 1650 F. The hearth of the furnace is a rotating flat ring with the diameter and width determined by the size of parts and production desired (Industrial Heating Dept., General Electric Co.).

Middle—
The charge end of a fuel-fired, radiant tube pusher furnace for carburizing rocker arm shafts. Specified capacity of this equipment is 1100 lb per hour of rocker arm shafts carburized to a 0.040-in. case depth (Electric Furnace Co.).

Bottom—
This hardening furnace, which sorts hardened automotive transmission parts, has an automatic tipover at furnace discharge. One basket tips left, while the other tips right to send parts to different following operations. Requiring no operator itself, the furnace is installed in a line which includes two welding stations and a scarfing machine (Holcroft & Co.).

the furnace hearth. Entry to and exit from the furnace equipment is frequently accomplished by means of vestibules which serve as lock chambers to preserve the furnace atmosphere.

1—DIRECT GAS-FIRED — roller rail tray pusher units used in applications where atmosphere control is not critical, such as the cycle annealing of cast iron castings and steel forgings.

2—FUEL-FIRED RADIANT TUBE—used extensively for higher temperature (1450 to 1750 F) operations; atmosphere usually endothermic or rich exothermic. Applications include carburizing, hardening, or carbonitriding of splines, gears, rocker arm shafts, and transmission drive shafts. This type of furnace is also used for malleabilizing, annealing, cycle annealing, and normalizing operations.

3—FUEL-FIRED MUFFLE TUBE — equipped with one or more muffle tubes sized to accommodate work; atmosphere gas generally hydrocarbon enriched endothermic. Applications include hardening camshafts and transmission main shafts.

4—ELECTRICALLY HEATED—used for malleabilizing iron castings in rich exothermic atmosphere; for bonding steel and aluminum strips in dissociated ammonia atmosphere; and for normalizing.

5—EXTERNAL FUEL-FIRED, FORCED CIRCULATION — heated by means of burners firing into a refractory lined combustion space separate from the heating chamber proper. Typical installations are for heating cast iron clutch drums for shrink fitting and for drawing hardened carbonitrided gears.

6—DIRECT FUEL-FIRED SLOT-IN-ROOF—has fixtures supported above the furnace and extending downward into the furnace through slots on which, in turn, the work is supported; used for hardening and drawing axle shafts.

Chain Conveyor

Chain conveyor furnaces incorporate several methods of conveying work through the heating equipment. The most common of these is to place the work directly on chain strands which travel in guides in the furnace hearth.

1—DIRECT FUEL-FIRED CHAIN STRAND—installations of this type have been made for hardening and drawing of automobile stabilizer bars. These are also used for preheating V-8 and V-12 engine crankshafts.

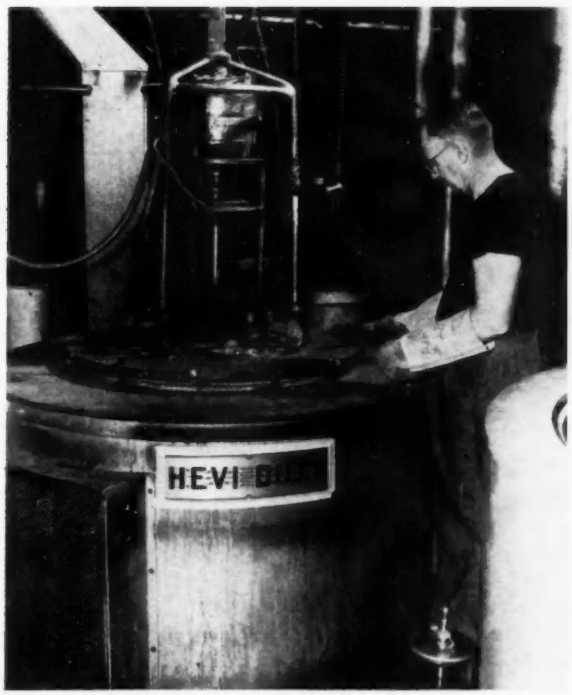
2—FUEL-FIRED, RADIANT TUBE HEATED CHAIN SLAT—incorporates forced convection atmosphere circulation; used for the annealing and bluing of silicon steel motor rotor laminations after assembly by means of aluminum die casting.

Rotary Hearth

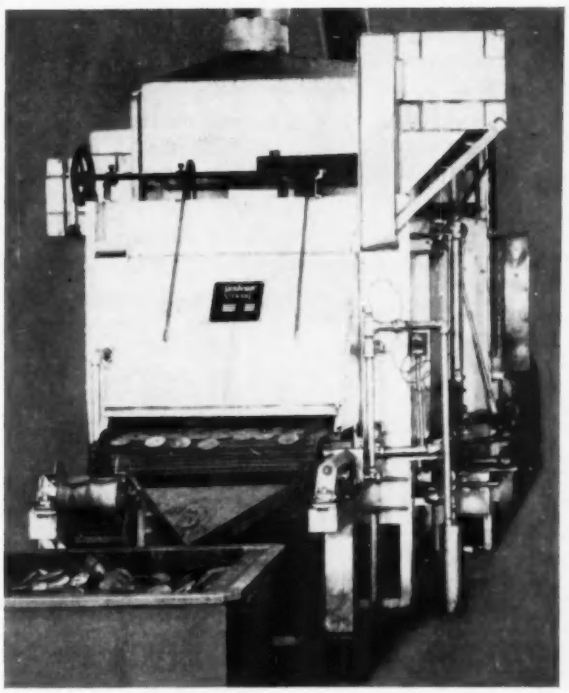
This familiar type of furnace incorporates a circular rotating

(*Turn to page* 54, *please*)

This pit furnace is used at Perfect Circle Corp. for the steam tempering of piston rings. The protective coating imparted by a steam process of tempering extends the life of the rings considerably (Hevi-Duty Electric Co.).



Discharge end view of an annealing furnace at the Chrysler Corp., New Castle, Ind., Machining Plant. It is annealing flat disks for ball joint suspension assemblies. Furnace is of the air recirculating, continuous conveyor type. (Industrial Furnace Div., Sunbeam Corp.).



Steamship companies use a powerful crane to lift containers on or off the railway cars

Containers for
Highway-Rail-Ship Use

TRUCK and trailer manufacturers are watching closely a development in the transportation of goods that promises to account for about 10 per cent of the total trailer output for 1959, and could at some future time become the most important item of production in the industry. This is the production of containers for highway, highway-rail, or highway-rail-ship use.

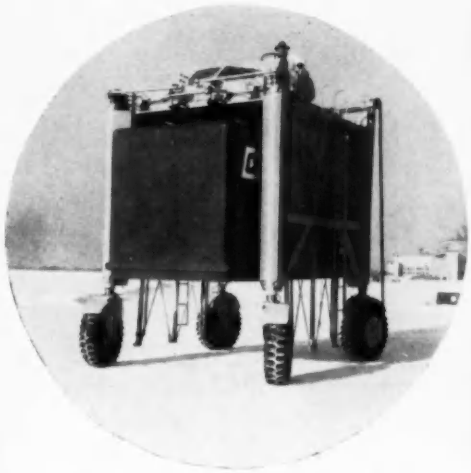
The container is the logical outgrowth of the trend in the concept of the truck. Starting with the motive unit and the cargo-carrying unit in one structure, the automotive designer quickly arrived at the trailer, in which the motive unit could be kept at work on the road while the cargo-carrying unit was being loaded or unloaded. So general has been the acceptance of this idea that there are about 1.8 trailers for each tractor in service in the country today. The next step designwise was the development of the container as a unit separate from both the motive unit and the trailer under-construction, so that the capital investment represented by tires, license fees in some states, and other trailer costs could be kept at productive work, and only the cargo-carrying box need remain at the loading dock or in the warehouse.

At about the same time another factor was coming into the use of the trailer. It was found that at certain times and under certain circumstances it was advantageous to load the trailer onto a railway flat car or special car and to haul it to its destination, reducing the motorized portion of the haul to local cartage. The container idea fitted into this also, with some additional advantages, such as providing lower clearance, keeping the capital investment in the trailer chassis in productive use instead of riding idly on a railway car, and offering the possibility of smaller multiple units for use on a single chassis. Finally, and most important of all at present, it offered the possibility of moving goods over a variety of transportation media without manual unloading and reloading one or more times in the course of the movement.

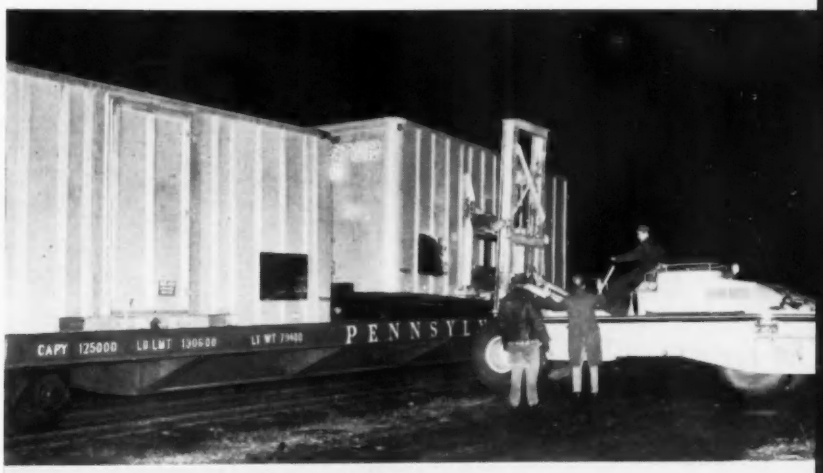
Shipping interests have been most willing of those in the transportation system to make use of the container setup.

Some ships have already begun the process of compartmentization to use containers effectively. The largest users of containers at present are the steamship companies, and the railroads.

Obviously, the container can realize its full potential in the movement of goods only if it can



Straddle crane on rubber tires for use in railway yards



Top — Clark-Ross Y260 loading Mobilvan at Pennsylvania R. R. yards, New York. Bottom—Loading PAT container on converted railway car

By Kenneth Rose

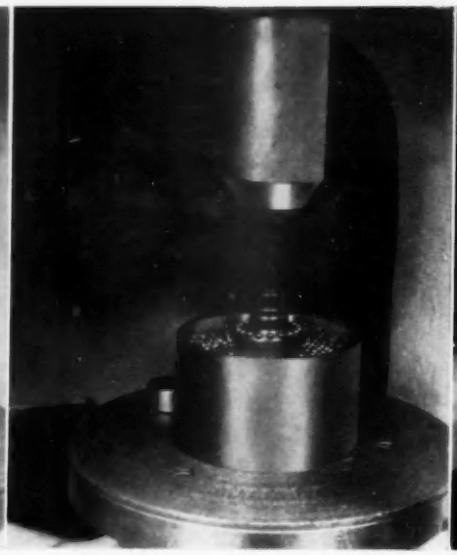
move from one transportation medium to another throughout the country, and perhaps eventually throughout the world, and the key to this is standardization. Standardization must include the size of the container, a system of transfer, and a system of hold-down. There are about five such systems at present, along with many variations and partial systems. These are:

1) The Flexivan system, owned by Flexivan Corp., and using containers made by Strick Co. of the Fruehauf organization. It uses modified flat cars, loaded by moving the container from the trailer onto the car in a cross-position, then swinging it into line by means of a turntable in the car deck. It has the advantage of side loading onto the car, so that the railway cars need not be shifted to bring a certain load to the end of the train for unloading. Its use by New York Central railroad has given it a certain currency also, in that truckers in cities along the New York Central system feel inclined to adopt a system that will permit them to use road-rail interchange. These are 35-ft containers, and the cars currently in use are about 79 ft long.

(*Turn to page 73, please*)

General American Transportation Company's roll-on, roll-off railway car

In this series of illustrations is depicted the assembly of a typical double-row SBB bearing. To begin the assembly operation, the inner race is inserted in the assembly fixture.



With the inner race (note the two raceways) held in place by the assembly fixture, a full complement of balls for the lower raceway is raised into position and deposited.

The lower raceway now contains its complement of balls—the ball carrier has been retracted—and the fractured outer race is about to be dropped over the inner race, to rest on the balls.

Special Techniques for Making

What Is a "Split" Ball Bearing?

SPLIT Ballbearing bearings are different in that the outer race or "ring" is generally fractured at a single place during manufacture. (The company also makes the double-fracture type, where both inner and outer races are fractured in two places.)

The single "split" method allows the outer "ring" to be spread apart enough at the break to permit admission of a full complement of balls and still retain continuous race shoulders. By use of more balls, it is said to result in a bearing which, in a given size, has increased radial-load and two-directional-thrust capacity.

When closed, the fracture in the race is invisible, and the mating faces interlock with each other through the metallic "dowels" in the break. Split Ballbearing says the fracture in no way impairs the operation of the bearing.

THE manufacturing facilities of Split Ballbearing, a division of Miniature Precision Bearings, Inc., have been modernized and tripled in capacity with a new $600,000 plant at Lebanon, New Hampshire.

Many provisions for increased operating efficiency were preplanned and incorporated into the new plant. It was possible to achieve them because the plant was built around the desired production layout—rather than into an existing housing. In addition, the construction of the building and the auxiliary services were planned to lend themselves to future expansion—another important consideration for this growing concern.

Total floor area is around 34,000 sq ft, with about 29,000 sq ft in the production section. Materials handling in the plant has been laid out to allow a continuous flow, in a circular pattern, of materials from point of entry, through production, to shipping, without any backtracking.

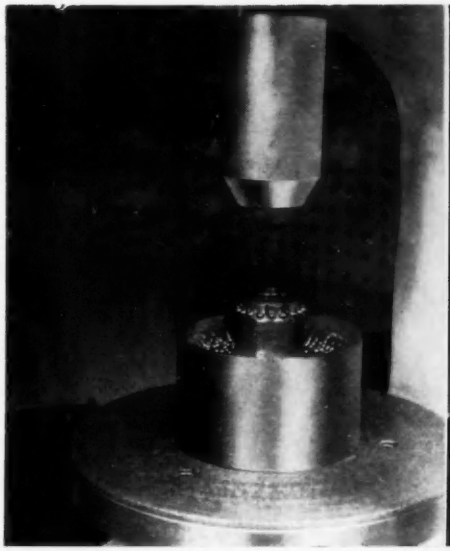
Machining Methods

Conventional methods are employed in the machining operations. The work is performed on facing, boring, grinding, lapping, and honing machines, etc., of established makes such as Conomatic, New Britain-Gridley, Heald, Cincinnati Micro-Centric, and Bryant.

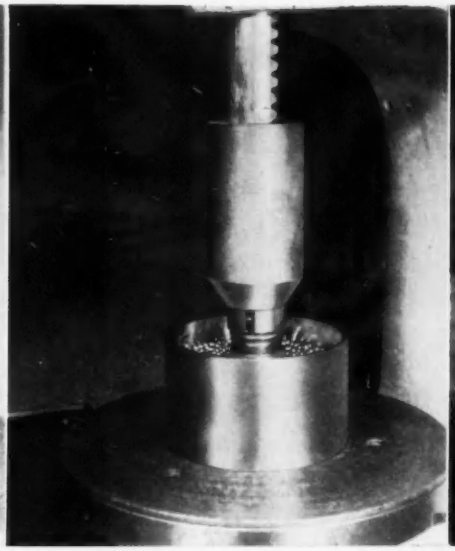
Assembly Room

Probably the most noteworthy feature of the manufacturing section is the final assembly area for bearings, known as the "White Room." About 7000 sq ft in size, this fully-enclosed room is climatized by an air conditioning system which maintains a temperature of 75 F and a relative humidity of 20 to 40 per cent.

Unique bearing assembly stations are set up in the "White Room." At each of the assembly stations there is a semi-circular peg board in which can be inserted a



Once again a full complement of balls is raised into position—and will eventually tumble over the top of the outer race and rest against the inner race. The ball carrier is about to retract.



When pressure is applied to the outer race, the fracture in the race opens up, allowing the upper row of balls to fall into position and the outer race to slide over the lower group of balls.

When this pressure is released, the fracture closes with both groups of balls engaged in the raceways. Here is the assembled bearing, ready for washing, inspection and packaging.

Split Ball Bearings

By Charles A. Weinert

number of rod hangers. The work place layout is so arranged that the average reach of an employe is about 9 in. and maximum 18 in. In preparation for bearing assembly, the inner and outer races are first gaged and matched for size, and the matching bearing parts placed on the corresponding size-marked rod hangers.

Just prior to the actual assembly operation, the outer races are fractured. For "single fracture" type bearings, the ring is broken through the cross-section in one place (which was scored during the machining operations), using a specially-designed breaker.

The inner race is then placed on an assembly fixture, balls are taken up to the inner race in a circular carrier, and the outer race opened up and stretched over the balls. Following this, snap rings are placed in machined grooves on both sides of the outer race to hold it firmly in place.

After assembly, the bearings are carried over to a new Ransohoff washing machine. Upon emerging from the washing machine they are placed on a gravity roller conveyor which leads, successively, to final inspection, slushing in heated oil, and "intimate wrapping"—all within the dust-proofed and climatized confines of the "White Room."

The final packaging and shipping area is outside, but immediately adjacent to, the "White Room."

Output

Initial production at the new plant is at the rate of about 30,000 bearings per month. There is a potential with present facilities of around 100,000 bearings per month. Standard bearing sizes range from $\frac{5}{8}$ in. to about $6\frac{1}{4}$ in. OD. The plant equipment can handle bearings up to about 8 in. OD. ■

Overall view of the "White Room" in SBB's new plant. Assembly stations are shown at left. The washing machine and gravity roller conveyor that carries assembled bearings through final inspection, slushing in oil, and "intimate" wrapping are at right and in background.

Advanced Painting Techniques at Mercury Assembly Plant

Body shells going through the first color booth

In Ford's Mercury assembly plant at Metuchen, N. J., technological advances in paint and particularly spray painting equipment have made practical, from a production standpoint, the wide selection of brilliant hues visible on the highways today. In this plant, the spray painting facilities, designed by the Binks Manufacturing Co., Chicago, consist of a complex of mixing tanks, pumps, piping, pressure regulators, oil and water extractors and spray guns. This system provides the means for application of nearly 1000 gallons of paint in 16 colors daily at the plant.

It would be impractical to apply such a variety of colors in that quantity without the aid of some kind of central system. Costs involved in supplying multiple spray stations with that kind of color variety would be prohibitive. Centralization of mixing, pumping and replenishing under one roof has made it economically feasible to paint in a variety of colors.

Twenty air operated Binks paint pumps in the paint house provide each of 29 spray stations in the plant with paints of identical viscosity and color. Paint that is not used in its journey past the spray stations is returned to the recirculating tanks to be pumped again.

The paint begins its journey to the finishing department in the 689,000 sq ft plant from the paint house which is located about 50 ft from the main plant.

Each of the 16 colors has its own pipe system and pump. Pipe lines travel from the paint house underground to the main assembly building. They then travel up the sidewall to the ceiling and across the plant to the spray painting booths. Here each color line separates into two outlets, one to each side of the various booths.

For the first step in the finishing process, the bodies move along on a continuous conveyor and enter a phosphatizing cabinet where the metal is thoroughly cleaned of all dirt and oil. After this, they are given an alkali bath and rinsed with warm water.

Next, an acid solution is applied to lightly etch the steel surface. This makes for better adhesion between the enamel and the steel.

Now the metal is ready for the primer coat. The conveyor moves the clean body into the first spray booth which is 75 ft long and 15 ft wide. There is a total of six spray stations in this first booth. Each station is equipped with heavy duty production spray guns. Here, two spray painters, working from opposite sides of the shell, apply the primer.

The next pair of spray painters apply a neutral gray surfacer and guide coat in further preparation for the enamel. This provides a good sanding surface. The last two painters in the booth spray door jams, interiors and other spots with the gray surfacer.

All spray booths in the plant are downdraft of the waterwash type to remove fumes and overspray. The air in the booths is constantly moving from the ceiling to the floor where it passes through gratings. The overspray comes in contact with moving water beneath the grating and is washed to collecting pans for later removal.

After the surfacer is applied, the shell moves into an oven where the primer and surfacer are cured at 350 F for 27 minutes. From the oven the body moves to an area known as the wet sank deck for a wet sanding. Following this treatment the shells are ready to go to the enamel booths, where the Binks circulating system provides identical finishes at every spray station.

According to Metuchen officials, the use of the circulating system has enabled them to eliminate pressure fluid tanks, long hoses and other items of paint handling equipment.

The M-E-L Division plant uses 20 Binks air-operated material handling pumps to move the paint in the plant's lines. These

(*Turn to page* 74, *please*)

International Harvester B-275 has a 35-hp Diesel driving through an eight-speed transmission

International Harvester B-450, powered by a 264-cu in. Diesel, features self-energizing disk brakes and a heel-operated differential lock

Newest British Farm Tractors

SHOWN here are some of the latest farm tractors produced in Great Britain. British Ford has developed the Fordson Narrow Dexta for vineyard and orchard use. International Harvester of Great Britain is offering two new wheeled models: the B-275 made in the company's Bradford factory; and the Farmall B-450 from its Doncaster plant. Massey-Ferguson puts out its Model 65 with ground clearance raised to 27 in. under the axles. David Brown supplies a rear air-operated tool bar for its 2D Diesel tractor originally designed for mid-mounted implements. ■

Massey-Ferguson "65" High-Clear has ground clearance raised to 26 in. by using 38-in. rear tires and front axle extensions

David Brown 2D tool carrier for mid-mounted implements is offered with a rear toolbar positioned by a pneumatic ram

◀ *Fordson Narrow Dexta, designed for vineyard work, has tread adjustable down to 52 in.*

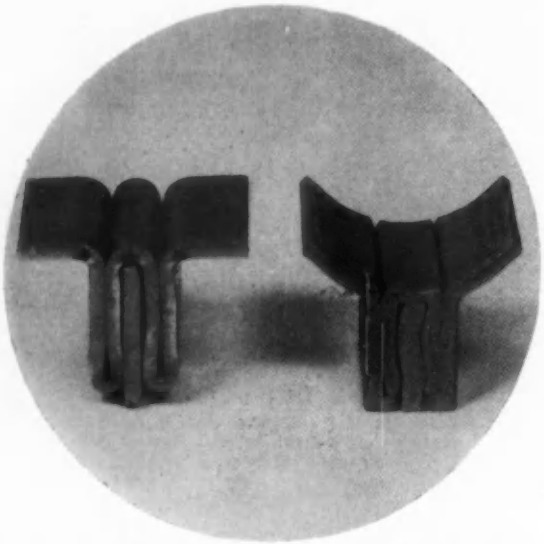


Fig. 1—Pole shoe for the windshield wiper motor is made in two steps from steel strip. The first step is the folding of the strip into the rough form seen at the left. The finished piece at the right has been coined in a single operation in a 400-ton Minster press.

Ingenious Methods *for* Volume Production of Electric Windshield Wipers

By Joseph Geschelin

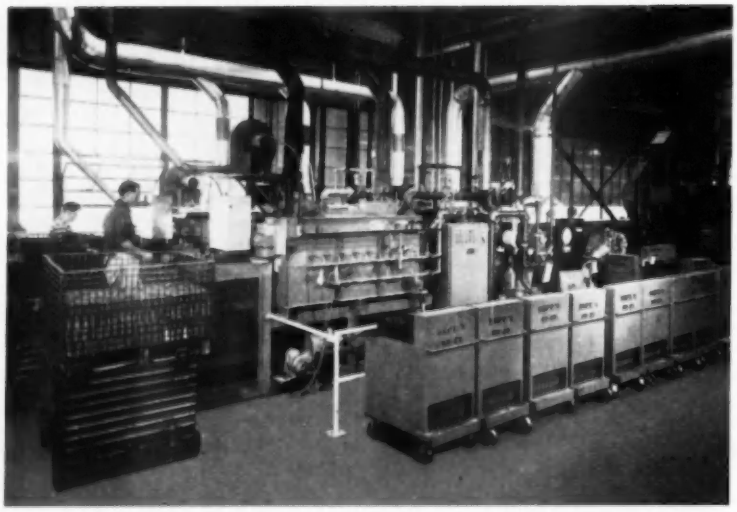


Fig. 2—Group of Selas furnaces for annealing rectangular motor housing.

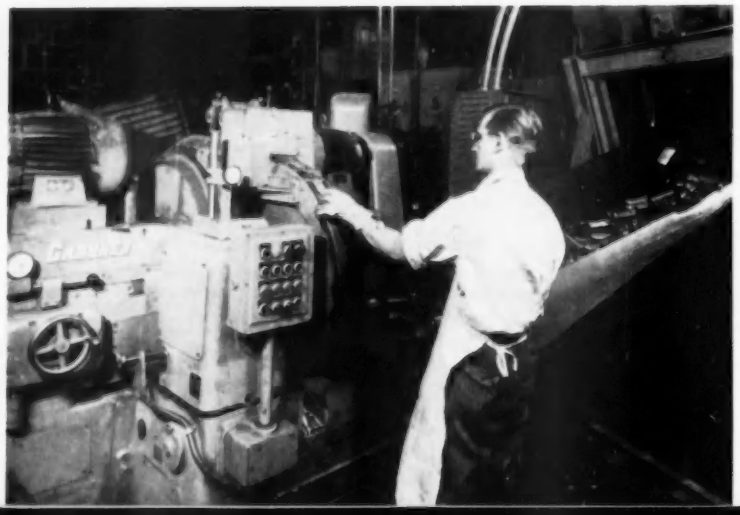


Fig. 3—Rectangular motor housings, which may be seen on the chute at the right, have both ends ground in this Gardner double-end grinder.

ELECTRIC windshield wipers have become still bigger business now that all General Motors cars install them as standard equipment. To supply this demand Delco Appliance Division of GM in Rochester, N. Y., is currently producing something over 300,000 units per month. These are available in single-speed and two-speed types, with or without washers.

Variations in design for individual customers coupled with such large volume make this an operation in which product design and manufacturing techniques have been closely coordinated. All of the effort is concentrated upon simplicity of design coupled with durability and quality at the lowest possible cost.

Ingenious methods abound at every turn. They have been developed to increase productivity through extremely fast cycles and are coordinated with the best available kinds of mechanization to reduce or eliminate manual handling. The introduction of automatic methods and novel techniques has resulted in improved quality as a

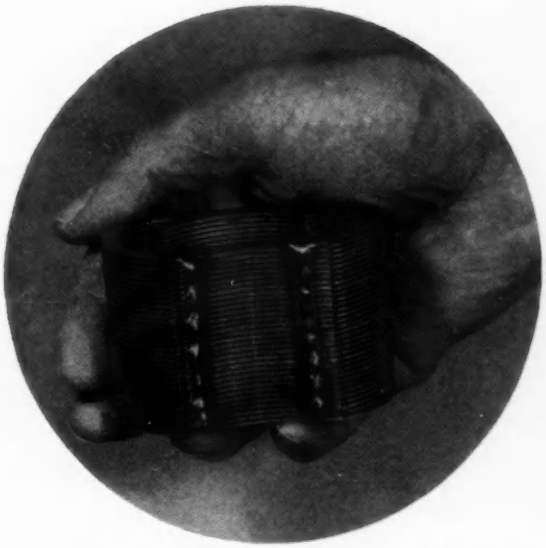


Fig. 4—This is an inert gas welded heater motor field core. It has four rows of welds, two on each side, eliminating the conventional riveting operation.

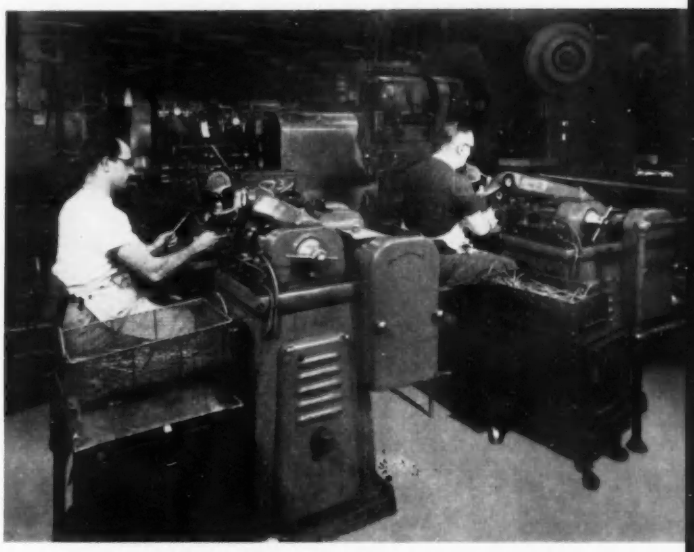


Fig. 5—Part of battery of five, Steinle thread generators for rolling deep worn threads on power motor shafts. Time cycle is only three-seconds.

byproduct. To take but one example: the extensive use of index table welding for sub-assembly operations eliminates the usual staking or riveting of components, produces greatly improved parts and eliminates rejects.

Noteworthy too is the development of new high speed automatic equipment for such specialized jobs as coil winding, coil taping, etc. Another rather interesting feature is the conversion of many of the familiar Denison hydraulic presses for surface broaching and hole broaching operations.

In general, both design philosophy and manufacturing methods are aimed at the conservation of materials — chipless methods — to reduce or eliminate offal. It may be of interest at this point to cite a number of such cases. Consider the pole shoe. As shown in Fig. 1, it is made of a single strip of steel folded to the rough form as seen at the right. This is done without making offal. Following folding in a special machine designed here, the pole shoe goes to a 400-ton Minster press where it is coined to exact size and formation as seen at the left.

Another example is the rectangular motor housing for the single-speed motor. It starts with ⅛-in. steel strip stock which is fed into

Fig. 6—Example of a Denison press converted for duty as an internal broaching machine. In a fully automatic cycle commutators are fed to the fixture from the Syntron at the right, 10 internal slots broached by the ram, and the parts automatically ejected through the chute below the bed. This compact setup produces at a rate of 2000 pieces per hour.

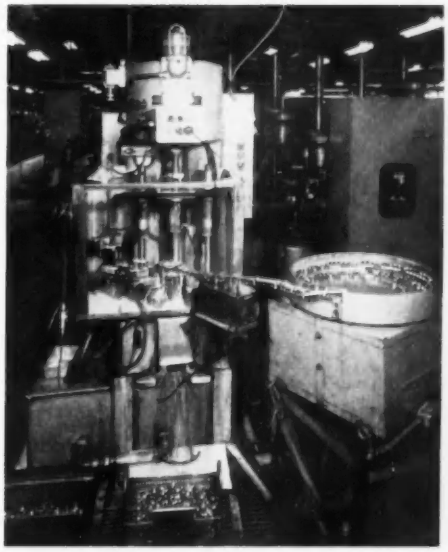
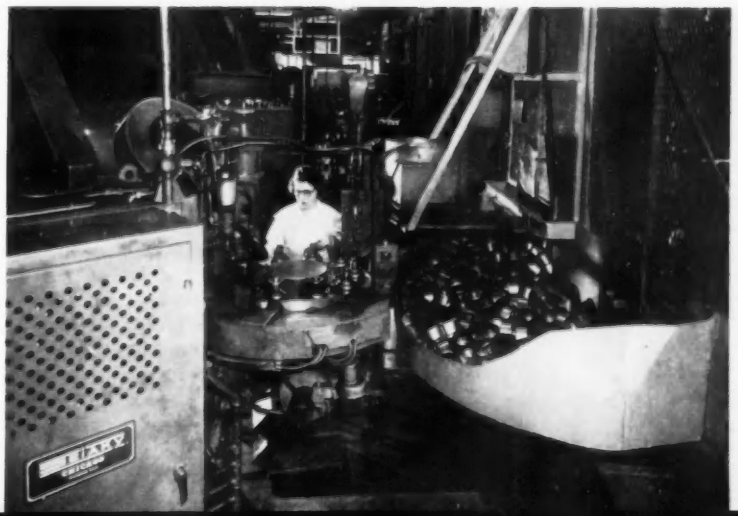


Fig. 7—Typical of many indexing table welding assembly arrangements is the one seen here. Delco utilizes a large battery of Sciaky welders, this one being set-up for welding components of a self-aligning bearing to motor case halves.



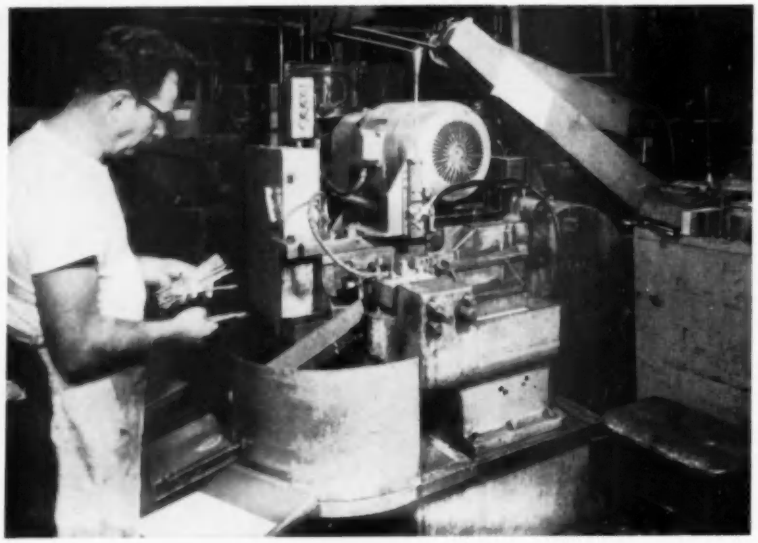


Fig. 8 — This Waterbury - Farrell machine is the last one in the line for machining motor shafts. The operation at this point is the rolling of the knurled end.

Fig. 9 — Heater motor case halves are produced from circular blanks in this seven-station Verson Transmat; and a six-station V & O transfer press.

a 400-ton Minster press, fitted with a progressive die. This produces the special formation for the base and bends the stamping into U-shape. No offal is involved in this stage. Next the U-shaped blank is put through another press where it is folded over at the top and welded to produce the closed housing. To develop the desired electrical characteristics the part is put through an annealing cycle in Selas furnaces (Fig. 2). Then it is ground at both ends in Gardner double-end grinders (Fig. 3). This is an extremely fussy operation since the ends must be absolutely flat, parallel, and square with the base.

Pole and armature laminations are made from the same strip of stock in Danly presses, equipped with progressive dies, the armature lamination being produced from the center section. Each type of lamination is fed from a different station and accumulated into a mandrel for easy handling.

The assembly of field laminations is quite distinctive. Instead of punching holes in the laminations and riveting together as is customary, the laminations are stacked and clamped, then welded together at four points in a Heliarc welding machine. The resulting product, seen in Fig. 4, is of better quality and much lower in cost.

We mentioned earlier the special attention given to extremely high speed methods. Here is one good example. Figure 5 shows part of a battery of five Steinle centerless thread rolling machines used to roll a deep worm thread on the power motor shaft. The job is done in a three-second cycle without producing chips.

We have another example which also illustrates the conversion of a Denison press (Fig. 6). This setup is designed to produce 10 slots in the small commutator shell. Shells are fed to the work fixtures from the Syntron at the right via the chute. One pass of the ram at the center produces the slots at the amazing rate of 2000 pieces per hour without operator attention. The work is ejected through the fixtures, coming out of the machine at the lower center.

Consider now one example—out of many—of the development of indexing table assembly operations feeding automatic cycle welding machines. Here we see the assembly of components of a self-aligning bearing to heater motor case halves (Fig. 7). It may be noted all such setups are motion studied to develop the most economical arrangement of parts storage and feeding, within easy reach of the operator.

The motor case shells are stored in bins at the right and fed into the hopper in the foreground. The small parts come in automatically from Syntrons in the background at both sides. The operator at the index table makes up the assembly at the station in the rear. The assembly fixtures then move progressively to the welding station of the Sciaky welder.

Fully automatic, compact process lines have been developed for ma-

(*Turn to page 76, please*)

Optical Gaging for Inspecting Inside Surface of Hollow Part

Kodak contour projector equipped with tracer probe and reticle-gage which are used to inspect internal dimensions of valve housing. Housing is seen in staging fixture. Probe fits in housing and reticle-gage probes motion, so that image of internal dimensions is cast on screen. Some point of circle seen on screen chart must be within reticle-gage tolerance lines for part to be satisfactory.

IN any production situation, inspecting the "blind" internal surface of a hollow part is likely to present a problem. When it is complicated by the need for critical internal dimensions within tolerances of ±0.0025 in., special measures are called for.

This type of situation was encountered when the Chrysler Corp. Indianapolis plant entered into production of the valve assembly for the company's Constant-Control power steering unit.

Production accuracy is essential in forming two lands and two undercuts within the valve housing. At the outset of housing production, the method for precision inspection was a slicing-and-layout procedure. Because this was a 1½-hour process, inspection sampling of the production run was limited to only one piece out of several hundred, depending on the results obtained.

By switching to optical gaging techniques, the 90-minute inspection of the valve housing became a two-minute procedure. The need for destroying a sample was eliminated. The optical method easily permits inspection of one housing in 70 as normal routine, with the ability to go to 100 per cent inspection any time it may become necessary.

The optical gaging inspection procedures are carried out with a Kodak contour projector located in the valve housing production area. Also there has been developed a compatible inspection system which checks out on a Kodak contour projector the spool valve that fits within the housing.

The inability to see within the valve housing is overcome in the optical gaging inspection process by the use of a tracer probe and reticle-gage. The probe, which has a ball-like tip, fits into the valve opening when the housing is placed in a staging fixture on the projector's worktable.

The glass reticle-gage contains a precision-scribed 1:1 representation of the internal housing dimensions, with maximum-minimum tolerance lines. It is the image of this glass reticle-gage that is projected on the viewing screen at 31.25 x magnification.

Tracer probe and reticle-gage, however, are linked. As the probe follows the internal housing dimensions, its motion is duplicated exactly by the reticle-gage. The projector casts an image of the

(*Turn to page* 79, *please*)

Cut-away of power-steering valve housing and the spool valve that fits within it are shown in upper portion of this illustration. An intact sample of the assembly is at lower left.

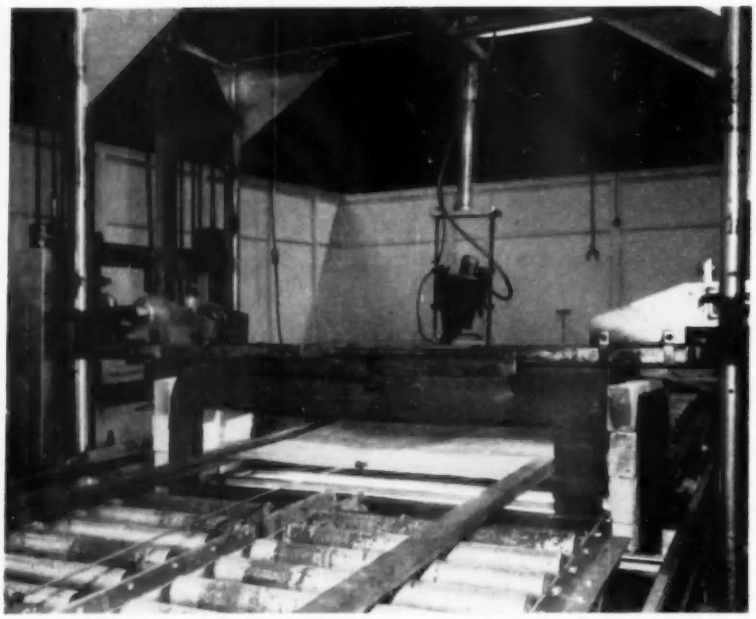
New Brazing Technique for Stainless Honeycomb

A NEW method of fabricating brazed stainless steel honeycomb sandwich panels has been developed by Temco Aircraft Corp. of Dallas, Texas. Patents have been applied for by the company, which has labeled the product "Temcomb."

Basic theory of the process is that if the assembled sandwich materials are heated uniformly and at the same rate throughout, the assembly can run through a brazing cycle without significant warping. Temco has found no more than the usual amount of warpage experienced in other methods and utilizes stretch-forming for smoothing the panels and shaping them into contours for airframe assembly.

The stainless steel honeycomb, skins and silver brazing alloys used are all standard materials. They are assembled much as in other brazing processes and placed in a foil envelope so that air can be removed and suitable atmosphere provided for secure brazing. The entire assembly is then mounted in a fixture which is automatically pulled through the gas-fired radiant heating element, with the speed of the panel and therefore its heat regulated through use of one or more Thermopiles.

During the automatic movement, the heating element simultaneously pre-heats, brazes and heat treats the component. The pre-heating is accomplished at 1100 F, with brazing temperature of 1750 F. The brazing operation also provides the austenite conditioning treatment for precipitation hardening type stainless steels. Following brazing the panels are stretched as required, supercooled to —100 F and aged at 905 F to yield the RH 950 condition.



This prototype furnace accommodates panels of various sizes, which can be stretch-formed to contour

Testing of panels of 0.008 in. 17-7 PH sheets assembled with 3-20 17-7 PH core resulted in the following average strengths, at room temperatures: Flatwise compression, 1910 psi, and flexure in the longitudinal ribbon direction, 201,600 psi.

Tensile test specimens removed from the skins of brazed panels which had subsequently been processed to the RH 950 condition exhibited the following properties:

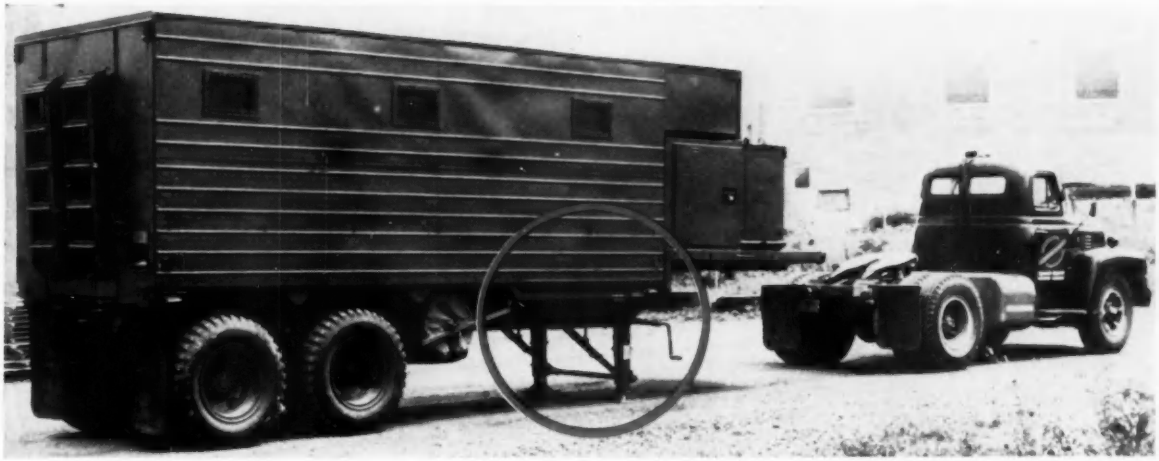
Material	Ultimate Tensile Strength	Ultimate Yield Strength	Per Cent Elongation
17-7PH	210,500	195,300	5.5
PH15-7 Mo	228,000	213,000	3.0

Panels have been put through the process at speeds up to 18 lineal ipm, but normal operations are from 6 to 8 ipm.

Length of panels is dependent only upon material sizes that can be handled easily and economically. Width can be varied, with Temco's present furnace being capable of handling panels several feet wide.

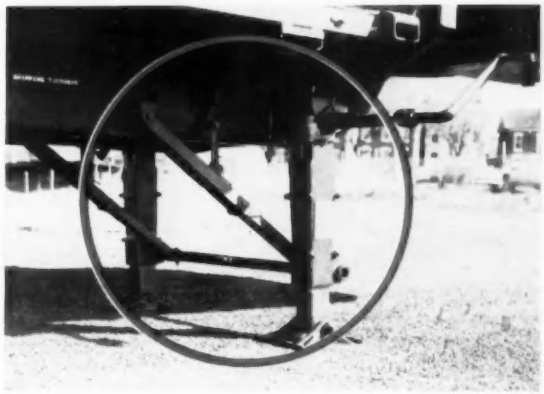
The company's stretch-forming operations utilize a set of pneumatic jaws and a special attachment which grips the sandwich firmly but without damaging it. Stretching is accomplished over large dies, providing smoothly contoured sections which will fit close-tolerance specifications.

Company engineers believe savings will result from many factors. First, there is complete elimination of the large carbon block assemblies and the huge furnaces required to heat such equipment. Secondly, the Temcombing process is much faster, permitting quicker production of panels of varying sizes and shapes. Another saving would come as a result of the size of the panels which can be accommodated, with larger panels reducing the chance of compounding critical tolerance errors. ■



Landing gear in parking position. Single crank fully automatic operation for both "up" and "down" positions.

Semi-Trailer Landing Gear Operated Through Ball-Bearing Screw

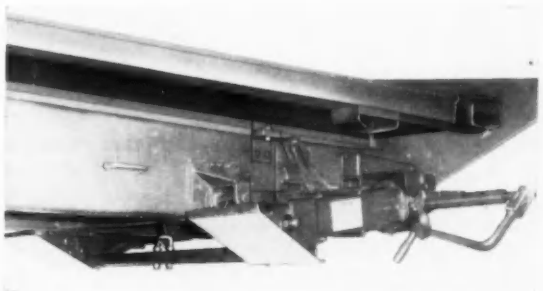


Semi-trailer detached from tractor with landing gear in parking position.

A NEWLY designed double retraction landing gear assembly for semi-trailers is now available from the Boyertown Auto Body Works, Boyertown, Pa.

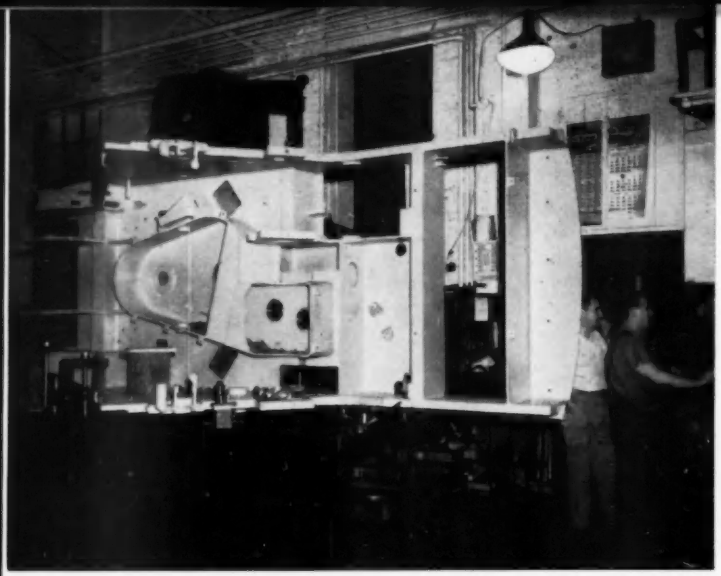
Easy operation of the unit is assured with the use of a Saginaw ball-bearing screw assembly. By turning the operating crank in a counter-clockwise direction, the lower telescoping section of the assembly raises to a maximum point which clears the ground, continuing to turn the operating crank in the same direction two full turns more, the entire gear assembly folds upward against the trailer frame and automatically locks in place, providing maximum road clearance.

When the semi-trailer is to be parked, disconnected from the tractor, the operating crank is rotated in a clockwise direction. This causes the landing gear assembly to automatically unfold to a vertical position, securely locks it in place, and by continuing to operate the crank in the same direction, the lower telescoping section is lowered to the ground and lifts the semi-trailer free of the tractor. The capacity of this landing gear is 12,000 lb. ■



Landing gear in fully folded or retracted position with automatic lock in place. Gear extends only approximately five inches below trailer chassis frame

Completing welding of the turntable on large positioners



The first of three horizontal boring mills bores all vertical holes

Versatile Machines at

A FUNDAMENTAL problem of most manufacturers of earthmoving equipment is to achieve low production costs with relatively low production rates. Capital investment can be held low only by using versatile machinery that can be used on several sizes or several models of a part. To keep lost time at a minimum, changeover from one type of workpiece to another must be quick and simple.

At Koehring Co.'s Milwaukee plant, a line of excavators is made, ranging from 1 cu yd to 3 cu yd in size. These are of the same basic design, with a size range in the parts to provide the range in capacity.

Typical of the methods used by Koehring to hold down machining costs is the method for machining the turntable or the excavator. This piece is a heavy steel boxlike weldment ranging in size from a 12-ft length and 5-ft width, in plate of about ¼-in. thickness, to an 18-ft length and 6-ft width, of ¾-in. plate. It houses the engine, transmission, controls, chain drive, the clutch system to engage any of the drives for the crane, shovel and hoe, and minor accessories. It is mounted on the car body, and rotates horizontally through 360 deg. Fabrication of the turntable for the 405 model is representative of the practice for all.

The 405 model is a 1 cu yd unit. The turntable is made of ⅜ and ½-in. mild steel plate, cut to size and shape by multiple flame cutting, with templates to guide the master stylus of the pantograph. Some of the smaller and lighter pieces are sheared. The structural subassemblies are first welded on setup fixtures by manual arc methods. These are then moved to large positioners, where they are welded into the rectangular housing in a sequence of manual arc welds requiring 15 different positions to obtain downhand welding. The weldment is then shot blasted, and sprayed with a primer coat of paint.

Machining of all turntables in sizes from the 12-ft length to the 18-ft length is done on three horizontal boring mills and one radial drilling machine. On the first, where all vertical holes are bored, table positions and boring tool heights are tabulated for each size turntable, and table and tool are brought to the desired position by means of vernier scales on the table and at the machine column. On the second setting, a set of fixtures (one for each size) positions the work for the boring operations on all radial holes. On the third, a similar set of fixtures, one for each size, takes care of all horizontal holes. In each case, the machine is set up so that the fixtures are self-positioning on a fixed base or table, and the change from one size turntable to another requires only the lifting off, with a crane, of the fixture then in position and lifting the required fixture onto the locating pins or blocks. No elaborate setup is needed. The final machining operation, at the radial drill, catches a few miscellaneous holes without the need for a fixture, and without a special setup.

At the first boring mill, a Giddings & Lewis, the weldment is placed on its side on the table with a fixed datum as the starting point for all measurements. The two verniers, each about 10 ft long, give coordinates for the positioning of table and boring tool in a

By Kenneth Rose

vertical plane, parallel to the axis of table travel. The weldment and tool are aligned to the center line of the hole, and the hole is then bored, faced, and counterfaced. Four holes are bored, one at a time, with Davis square cutters. These holes are for the vertical drive shafts. Holes are held to a tolerance of plus or minus 0.001 in. between centers.

The second machine, a Cincinnati Gilbert, bores and faces the radial holes for the rollers by which the turntable is assembled

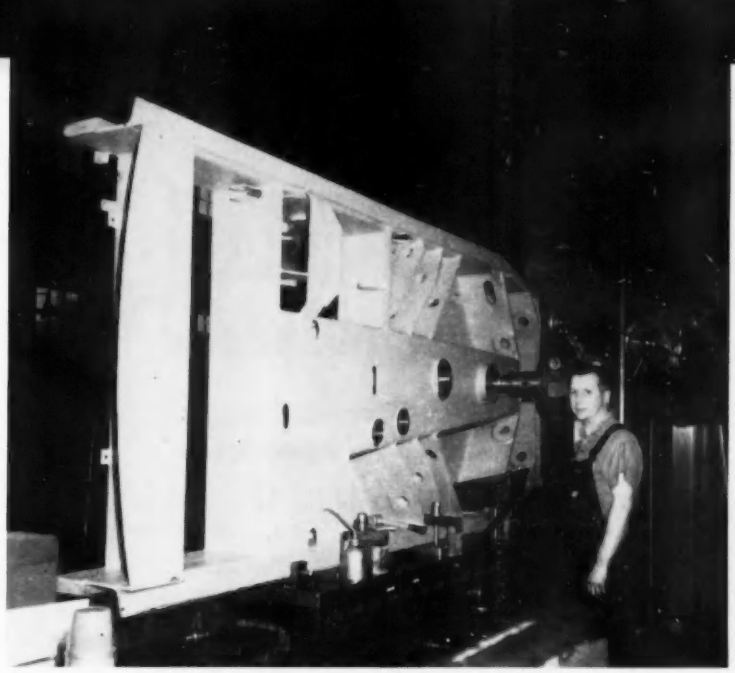
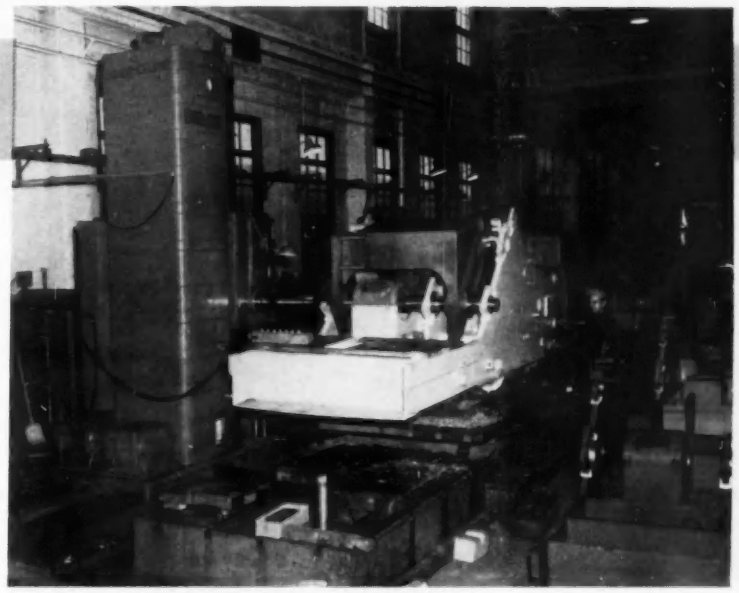


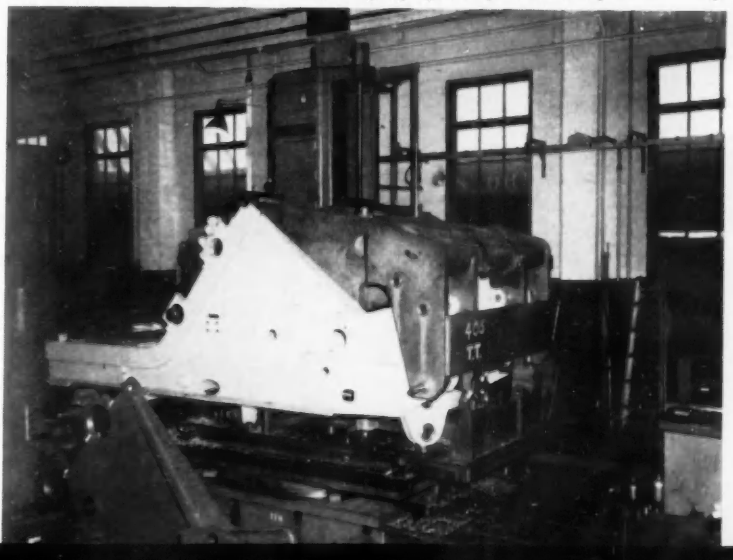
Table and tool are positioned by verniers

Koehring Plant



▲ *Horizontal holes are bored on this machine*

Heavy fixtures simplify quick, precise setup ▼



to the car body. There are four upper positions, for rollers that rest on top of the azimuth ring of the car body, and four lower positions, in which are held the four rollers fitting under the ring on the car body and resisting the tilting action when a load is being lifted by the boom. One cutter bores all eight holes, 3.253 in. in diameter. The turntable weldment is placed on a fixture supported on a pilaster with its center about 10 ft from the face of the machine column, so that all sizes of turntables can be swung on the fixture axis without other change in the machine setup. The turntable is positioned from the center pin of the fixture axis without other change in the machine setup. The turntable is positioned from the center pin of the fixture, and the eight radial holes are bored successively by swinging the fixture to bring inner and outer bushings in the fixture into line with the boring tool. There is a separate fixture for each size of turntable.

A Kankauna horizontal boring mill, the third in the series, bores all the horizontal holes in the turn-

(*Turn to page* 79, *please*)

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By Samuel Cummings

APT—Master Robot

A quiet revolution has been going on for ten years in short-run metalworking production. Numerically controlled machine tools which take their orders from instructions punched on tapes or cards are bringing about drastic changes in traditional concepts of design, inventory, and production methods. The impact of these electronic robots has been strongest in the aircraft and missiles field, where manufacturers have been hard put to adjust to the complex requirements of the space age.

The method of controlling a machine tool without a human operator was first demonstrated at the Massachusetts Institute of Technology nearly seven years ago, when an electronic brain automatically operated a small milling machine.

Instructions punched on tape in the form of numbers made it possible for this device—a small, special purpose computer—to control the machine more effectively than if a skilled machinist were on the job. Intricate metal parts could be milled with great accuracy.

Numerical control for machine tools has since been widely adopted by plants throughout the country. It has saved time and money for many companies, but a new bottleneck has become serious in recent years—that of preparing the instructions for the machine tool. For every new production item, a programmer must spend long hours in calculating the moves of the machine tool, and express these in numerical form for the tape.

Solving the Problem

The most promising method for solving this problem so far is a new system called APT—short for Automatically Programmed Tool—which allows a master robot to supervise another manless machine's production. The project, the joint effort of the M.I.T. Servo-mechanisms Laboratory, the Air Force, and the Aircraft Industries Association, was demonstrated publicly in Cambridge, Mass., late in February, where it was hailed as an important "breakthrough."

The breakthrough provided by the APT system consists largely in its use of a universal language that can be understood by any large general purpose computer equipped

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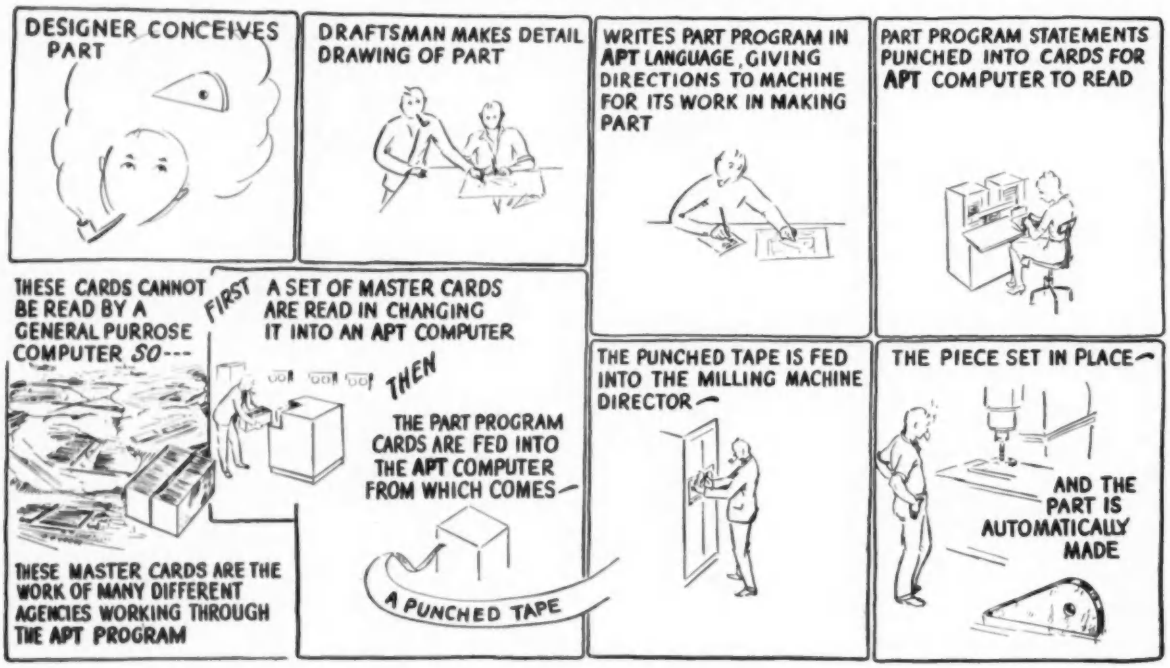
HOW THE APT SYSTEM IS USED



News of the MACHINERY INDUSTRIES

Machine Tool Orders Booked in February Totaled $45.5 Million, Up $4.5 Million Over the Value of January Orders and the Highest Monthly Volume Since August '57

By Charles A. Weinert

Machine Tool Orders In February Best Yet

Order bookings for machine tools during the month of February continued the recent upswing—and in dollar value represented the highest monthly volume since August, 1957.

Net new orders for cutting-type machines amounted to $36.05 million in February—up 24 per cent over January's $29.1 million, and up 58 per cent over February, 1958's $22.8 million.

February orders for forming-type machine tools showed a decline from January, with a volume of $9.45 million versus $11.95 million. In February, 1958 the equivalent volume was $5.5 million.

Taken together, the $45.5 million of net new orders for both cutting and forming types showed a gain of $4.45 million in February over January, 1959.

Shipments of machine tools in February totaled $36.1 million—up $4.8 million over January's $31.3 million.

In transmitting these figures—compiled by the National Machine Tool Builders' Association—Ludlow King, executive vice-president, commented in part as follows:

"The machine tool industry reached another rung in its slow but steady climb out of the 1958 depression. Starting its ascent in October, 1958, it continues upward on a sporadic month-to-month basis. Both cutting and forming type new orders are beginning to exceed shipments—a total of $19.15 million during the past two months.

"Both large and small builders report increased inquiries for substantial orders. Another healthy sign is the receipt of new business for builders of large machine tools—those requiring 9, 12 and 18 months to build. Some feel the international situation has prompted users to place firm orders for long overdue requirements."

Van Norman Distributors Stage Demonstrations

Some 400 metalworking executives participated in a demonstration clinic staged recently at Warren, Mich., by the Chas. A. Strelinger Co., Van Norman Machine Co. distributor. The purpose of the event was to acquaint production men with cost-saving ideas made possible with modern up-to-date machine tool equipment.

The featured unit in the operating demonstration was one of the new Van Norman 2C Diversimatic centerless grinders. It was equipped with a crush wheel dressing unit, automatic infeed, a chiller for the coolant, a Precipitron, and magnetic filters. In one of the demonstrations a $\frac{3}{8}$-in. diam. shaft, five inches long, was ground, removing 0.189 in. of material in 15 sec, while holding four diameters, two radii and a chamfer.

Garco Machinery, Inc., also put on a subsequent but similar demonstration at its plant in Cleveland during the latter part of last month.

Around the Industry

Cincinnati Milling and Grinding Machines, Inc.—Swan E. Bergstrom has been elected president, and Robert C. Bevis elected a vice-president and director.

Warner & Swasey Co.—Walter K. Bailey, president, says in the company's annual report that the present rate of incoming orders and production indicate machine tool shipments in 1959 will be 50 per cent higher than in 1958. The company's net income for 1958 was $1,151,536 on a product income of $39,271,528.

National Automatic Tool Co., Inc.—John R. Keates has been elected vice-president in charge of sales.

Jones & Lamson Machine Co.—is offering a new "certified maintenance" and service plan for users of the company's optical comparators. Under the plan, J&L specialists will check and adjust customer-owned comparators four times a year, and back these inspections up with written certificates of accuracy.

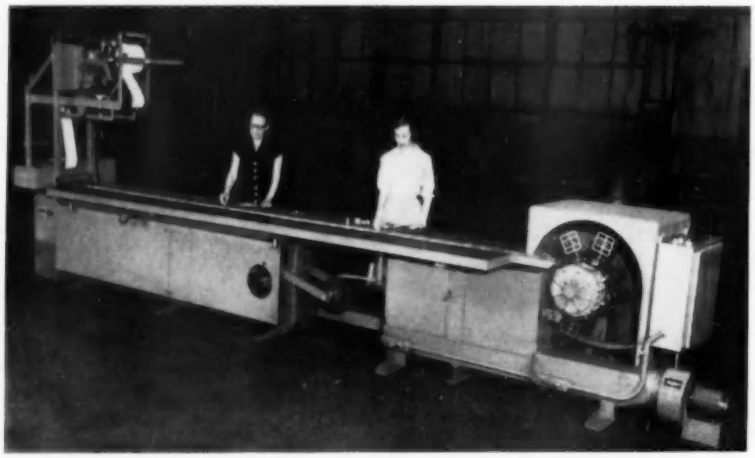
Moore Special Tool Co., Inc.—is now manufacturing jig grinders, jig borers, and universal measuring machines with calibrations in the new standardized International inch. The National Bureau of Standards recently announced that after July 1 it will calibrate all length measures and gage blocks in terms of the new standard, which is 2 millionths less than the present U. S. inch, 1.7 millionths greater than the British Imperial inch, and exactly like the Canadian inch—equivalent to 25.4 mm.

Lahr Machine & Tool Corp.—has formed a new division, known as Lahr-Tandco, and is expanding its product line to include production multi-unit machines, augmenting the Lahr tape-controlled deep-hole drilling machine, and air and hydraulic die cushions. The new division will be managed by John Hoenig, a vice-president of Lahr.

Heidrich Tool & Die Corp.—Rudolph Heidrich, founder and president, has retired. Jack Slean is the new president, and continues as general manager. J. A. Schensky has become vice-president-manufacturing. H. O. Love is now vice-president and general counsel; and P. G. Abbott is secretary-treasurer. ■

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

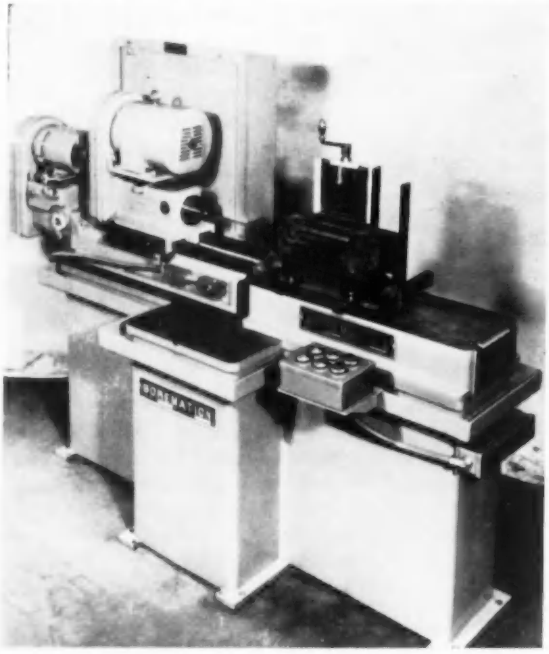


New Machine for Thermoforming Sheet Packages

Thermoformed packages—known as "blister," "bubble," or "dome-pack"—can be formed in a wide range of sizes and shapes on this Sundstrand-Packmaster Model 58. Packages measuring 4 x 4 in. are produced at a rate of 60 per minute. (Sundstrand-American Broach Div. of Sundstrand Machine Tool Co.)

Circle 30 on postcard for more data

Gun Drilling Unit Eliminates Secondary Operations



Secondary drilling, boring, reaming and honing operations can be eliminated by use of a standard Boremation "Gun Bore" gun drilling machine. Feed range of the Boremation series is adjustable and extends from 1/2 to 30 ipm. Spindle speeds range from 100 to 10,000 rpm. The machines are available in two standard sizes — 12 in. stroke (Model 1200) and 24 in. stroke (Model 2400). Both sizes are designed, engineered, built and tested to maintain tolerances as close as tenths of thousandths of an inch in deep hole drilling. (Drillmation Co.)

Circle 31 on postcard for more data

Lubricating Units

Two compact Lubro-Control units provide complete and efficient processing of compressed air for service to air cylinders, air chucks, air tools, bearings and other machine components. The smaller, for ⅛ in. pipe installations, measures 4½ in. wide, 4¾ in. high and 3 in. deep. Models are available for air flows from 0.05 to 20 cfm.

Each unit consists of: an air filter, a pressure regulator and a Micro-Fog lubricator. *C. A. Norgren Co.*

Circle 32 on postcard for more data

Bonded Mounting

DOUBLE extension center bonded mountings for isolation of severe vibratory, shock and related disturbances have been developed for use in flexible suspensions for all types of mobile, transport-mounted and portable equipment. The mounting is of one-piece construction with the elastomeric flexing element permanently

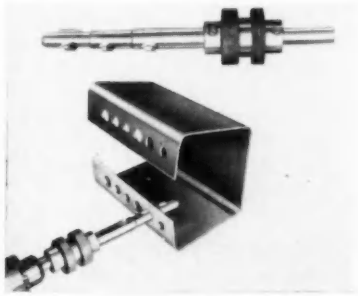
Lord elastomeric mounting has three compression sections

bonded to the steel inner member. Elastomeric end extensions are precompressed at installation to form two rebound shoulders for reverse loads. No lubrication or maintenance is required. *Lord Mfg. Co.*

Circle 33 on postcard for more data

Special Purpose Tool

THIS special purpose tool was designed for precision deburring both sides of nine different sized holes ranging from ¼ to 1¾ in. diameter. The tool has three separate pilot diameters and a cutter blade with three correspondingly positioned cutting



Nobur special purpose deburring tool

heads. It is used in a portable drill-motor and deburrs the front and back hole faces of three different sized holes without separate tool changes. As a safety feature, passage of the tool through to the working hole surface is made with the cutter retracted. *Nobur Mfg. Co.*

Circle 34 on postcard for more data

Cutting Coolant

CAMPBELLENE, a cool-blue coolant concentrate, containing Odormask, a highly effectively deodorant, is formulated for use with all makes of abrasive cutting machines and most grinding operations.

The coolant keeps abrasive wheels clean and sharp; promotes rapid chip settling; improves cut quality; minimizes odors; does not foam; inhibits rusting of machine and parts; retains full effectiveness for long periods of heavy production; and under certain conditions, will increase wheel life by 15 to 20 per cent. Under normal working conditions the concentrate should be used in proportions of one part coolant to 150 parts water. *American Chain & Cable Co., Inc.*

Circle 35 on postcard for more data

Machine Control Unit

A MACHINE control unit which will simultaneously control four independent motions of machine tools is available from the industrial Controls Section, Bendix Aviation Corp.

The input to the control unit is punched tape. The high speed tape reader on the control permits tape reading of 300 lines per second in the forward direction and 600 lines per second in the reverse direction.

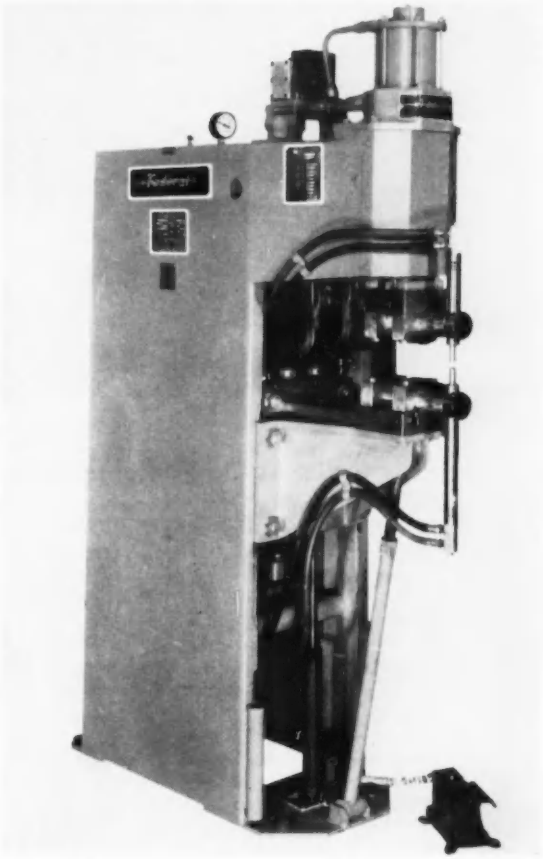
The unit performs with a command resolution of 0.0002 in. linear and 0.01 degrees rotary in the machining of any type part requiring twist type cutting operations.

Circle 37 on postcard for more data

Press Type Resistance Welders

A line of press type resistance welders is available in four sizes ranging from 30 to 500 kva inclusive. Each size is available as a spot welder, a projection welder, or a combination spot and projection welder in a range of standard throat depths, electrode forces and transformer sizes. Some of the design features are: one-piece slim line frame, easily adjusted for wear or take up, no covers to be removed. The integral transformer and lower arm gives high performance and maximum power efficiency. These welders are styled and constructed to deliver high production runs at low costs; they conform with modern production line requirements, neat, clean and compact. (The Federal Machine & Welder Co.)

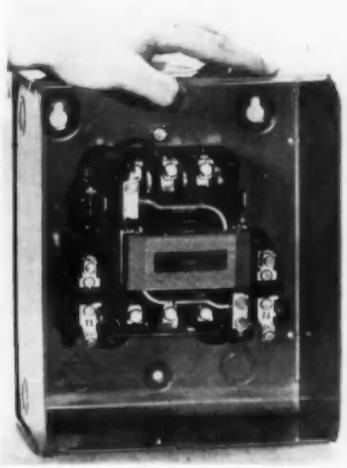
Circle 36 on postcard for more data



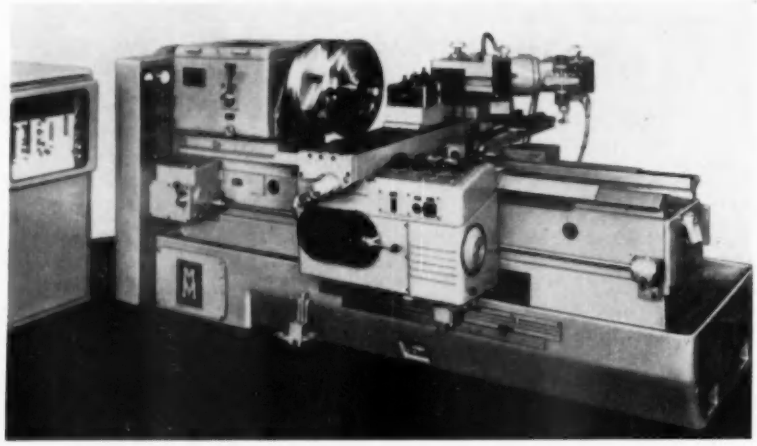
Magnetic Motor Starter

THIS NEMA size 2 magnetic motor starter, rated at 25 hp at 440/600 volts, includes a special arc trap to contain and quench arcs quickly and effectively. The trap is made of a magnetic steel that attracts arcs away from the movable and stationary contact tips. The shape of the contacts provide a natural blow out action for the arc which moves from the contact tips to the magnetic trap in two milliseconds or less. *General Electric Co.*

Circle 38 on postcard for more data



General Electric magnetic motor starter



Cosa high production lathe includes automatic "Eltropilot" control system

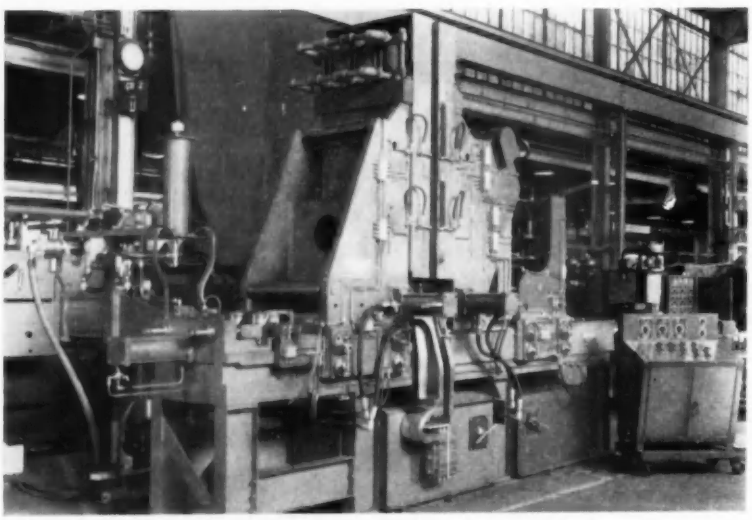
High Production Lathe Features Automatic Control

THIS production lathe, with a universal program control called the "Eltropilot," provides completely automatic machining of all types of workpieces.

The control provides pre-set, automatic control of all tool movements on the saddle, cross-slide, copy attachments, drilling units and turret head and of all operational functions such as spindle speeds, feeds, feed direction and rapid traverse. Machine loading operations are controlled by the "Eltropilot" also, as is the actual stopping of the machine.

The control can store 60 commands and control 20 operations, with combinations of 20 commands for any operation. *Cosa Corp.*

Circle 39 on postcard for more data



Sciaky Bros. flash-butt welder for use in various mill and process operations

Flash-Butt Welder for Use in Mill, Process Operations

DESIGNED for the continuous end-to-end fastening of flat wide strip stock, this 400H flash-butt type welder is used in various mill and process operations.

The machine shears off flash particles so that a continuous flush surface is maintained. Named the Sciaky BP.3-400H machine, it is designed for flash-butt welding hot rolled, low carbon steel ranging from 0.060 to 0.200 in. in thickness and from 12 to 22 in. in width. Or, a maximum capacity of 4.5 sq-in. cross sectional area of mild steel, and 2.6 sq-in. cross sectional area of stainless steel. The upset force is adjusted to a maximum of 90,000 lb, while clamping force is adjustable to a maximum of 135,000 lb. Maximum platen opening is eight inches, and flashing action is accomplished by means of the right hand platen. Pressure lubrication can be provided. The secondary or welding current is obtained from air cooled welding transformers rated at 400 kva at 50 per cent duty cycle. *Sciaky Bros., Inc.*

Circle 40 on postcard for more data

Ultrasonic Machine Tool

UP to eight ultrasonic machining operations can be carried on simultaneously on a multiple-station Sheffield-Cavitron ultrasonic machine tool, or each station can be operated independently.

Materials for ultrasonic machining include germanium, silicon, ferrite, glass, quartz, and similar hard brittle materials and metals.

A single magnetostrictive transducer mounted in the well of the table transmits 20,000 ultrasonic machining strokes per second to each station by means of the curved cylindrical transmission lines. A remote 1000 watt high-frequency electronic generator drives the transducer. Each station accommodates a cutting tool up to 1.08 in. in diameter, to machine workpieces to 0.050 in. depth. The table-high unit is approximately 4½ ft. in diameter. *The Sheffield Corp.*

Circle 41 on postcard for more data

Gear Shaving Process

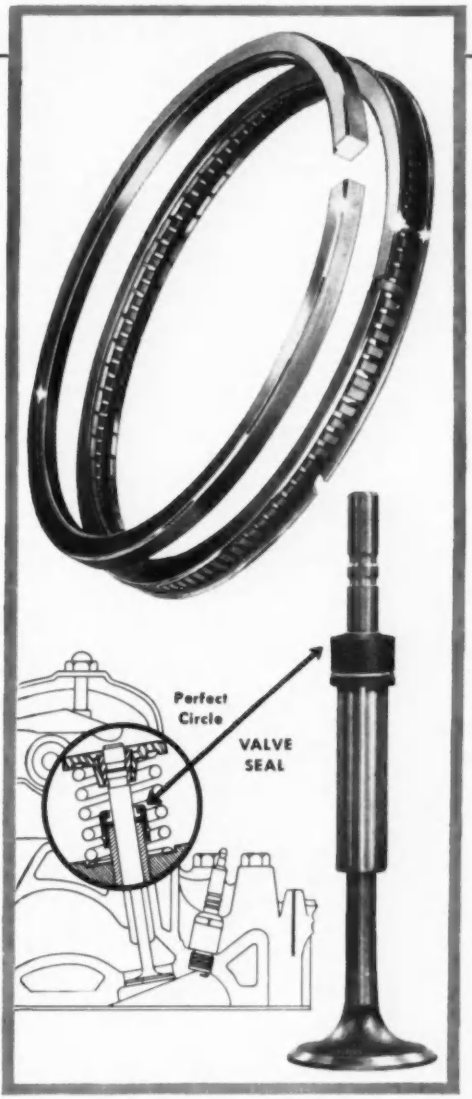
A ROTARY gear shaving process that provides accurate control of surface finish, profile and lead on gears having twelve and less teeth has been developed by National Broach & Machine Co.

The process makes use of an unusual precision rotary gear shaving cutter made in the form of an internal helical gear. This arrangement provides increased surface contact between the cutter and work gear profiles due to the enveloping action of the cutter. As a result, the cutter is able to produce smooth, accurate tooth profiles on work gears having small numbers of teeth.

Circle 42 on postcard for more data

(*Turn to page* 48, *please*)

2 reasons why engines get more power protection from Perfect Circle



1. PERFECT CIRCLE CHROME RINGS

solve problem of excessive oil consumption past pistons!

P C chrome piston rings are the finest obtainable! Top rings and oil rings are plated with thick, solid chrome. Entire area of ring travel gets complete wear protection, more than doubling life of cylinders, rings, pistons. No tedious break-in is necessary because rings are pre-seated at factory.

SPECIFY P C CHROME RINGS for thousands of extra miles of power protection with positive oil control!

2. PERFECT CIRCLE VALVE SEALS

solve problem of excessive oil consumption past valves!

New overhead valve engines develop higher compression pressures...and higher deceleration vacuum. Increased vacuum draws oil through loose or worn valve guides. Avoid this oil loss with new Perfect Circle Valve Seals!

SPECIFY PERFECT CIRCLE VALVE SEALS to control oil loss through valve guides in overhead valve engines.

PERFECT CIRCLE

PISTON RINGS AND POWER SERVICE PRODUCTS

Hagerstown, Indiana — **Don Mills, Ontario, Canada**

Laminated Plastic

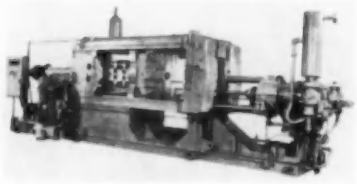
AN XXXP grade of laminated plastic for electrical applications where humid conditions are encountered is available in both plain sheets, designated as Dilecto XXXP-31EFR, and copper-clad sheets, named Di-Clad 31EFR.

Made from cellulose paper impregnated with epoxy resin, Dilecto XXXP-31EFR is used as insulation for computers and equipment requiring permanent flame-retardant properties. Di-Clad 31EFR metal-clad material is the same basic material with one or two ounce copper foil on one or both sides. It is used for printed circuit boards in the same equipment as the non-clad material. *Continental-Diamond Fibre Corp.*

Circle 43 on postcard for more data

1000 Ton Die Caster

THIS 1000 ton aluminum die casting machine is designed to make 40 lb castings of such parts as housings, motor blocks for outboard motors and similar products. The machine incorporates the Lester pre-fill injection system which provides initial speed

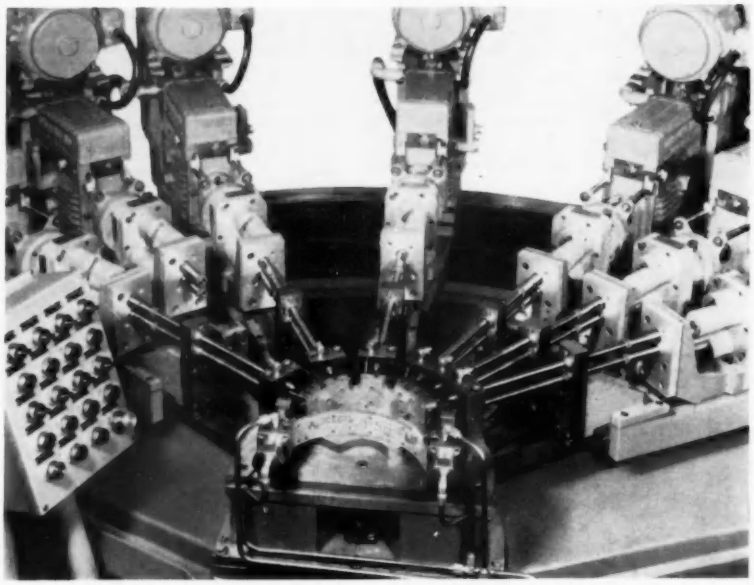


Lester-Phoenix 1000 ton die caster

with high final impact, to provide super-dense die castings with fine surface finish. The pre-fill system is used with a nitrogen accumulator with 11,000 cu-in. of capacity (at 2000 psi) for highest initial shot speed. The injection shot end of the machine is adjustable from 2 in. below center to 12 in. below center, with height controlled by a hydraulic elevating device. The support bars of the injection end are angled for easier metal pouring and both the shot pressure and shot speed are adjustable.

The 1000 tons of pre-loaded clamping is made possible by the one-piece alloy steel frame with its large beam area. Maximum die height is 42 in., adjustable to a minimum die height of 39 in., with a total daylight of 72 in. The die opening is adjustable from 30 to 10¼ in. *Lester-Phoenix, Inc.*

Circle 44 on postcard for more data



Drillunit quill-type drill units are designed to work in small, compact areas

Drilling Units Make Many Hole Patterns Possible

THE seven drilling units pictured above are capable of producing 121 different hole patterns. A single operator can drill 3600 brake bands per hour, at 100 per cent efficiency. The units can be moved left or right, and forward and back to obtain the desired hole pattern. Various depths required are set by the stroke and maintained by an internal positive stop to an accuracy of ±0.0005 in. by means of a convenient external adjustment.

The units are adaptable to single or multiple spindle applications, with 9 and 12 in. stroke, and up to 5 hp capacity standard. *Drillunit, Inc.*

Circle 45 on postcard for more data

Spindle Finishing Units

FIVE spindle-type finishing machines designed to give continuous "in-line" production of precision finished parts have been announced by Almco, Queen Products Div. of King-Seeley Corp.

The machines enable precision finishing of complex components such as gears, bearing cages, spline shafts, pump rotors, jet blades, etc. In most cases, 0.005 to 0.015 in. radii can be generated on hardened gear teeth contours in from 2 to 4 minutes, while surface rms is greatly improved. All surfaces of the part get the same precision finishing.

Cirrle 46 on postrard for more data

Rotary Broach

THE Rotary Broach, a Van Norman automotive machine, resurfaces cylinder heads, engine blocks, etc. to precision tolerances.

A built-in loading table permits fast top-side set-ups, directly from the machined surface of the work, and keeps the chips out. The cutters can be replaced, sharpened, and aligned individually by the operator at any time. *Van Norman Automotive Equipment Co., Div. of Van Norman Industries, Inc.*

Circle 47 on postcard for more data

Electronic Control

AN electronic device that provides a system of uniform time and temperature control in heat treating furnaces has been released by The A. F. Holden Co.

The instrumentation of the system revolves around an electronic timer that can be pre-set at predetermined fix points for both time and temperature through two phases of the heat treating process. Once the controls have been fixed and the furnace started, they cannot be changed or tampered with.

Circle 48 on postcard for more data

(Turn to page 51, please)

Circle 117 on postcard for more data ⟶

Memo to a Man of "Parts"

The number of different parts made from Roebling High Carbon Specialties, Flat Wire and Spring Steel are close to countless.

Some things you can count on, though, are the consistent dimensional and mechanical uniformity you get with any Roebling High Carbon Specialty. They are the qualities that contribute to speeding *your* production and cutting *your* costs.

They are high qualities that make for high values. Next time you need flat wire or spring steel, specify Roebling. Write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

Roebling... Your Product is Better for it

Behlen Delivers Heavy, Bulky Loads Promptly... Using The Spicer Presto-matic

Behlen buildings are unique. They incorporate the firm's own frameless metal design and utilize many new developments to obtain a wide variety of applications. The design incorporates a system of channel ridges, or deep corrugations, to give unusual rigidity to metal panels and make possible great strength.

Almost cat-like agility — that's what Behlen Manufacturing Company's powerful Diamond T 923 F's need, in order to thread their way in and out of construction sites. Only the most dependable equipment can be considered — for the Behlen building business is booming, and split-second delivery schedules are absolutely necessary. Down-time is out!

That's why Behlen ordered the Spicer Presto-matic Truck Transmission System in their newest purchase from Diamond T Motor Truck Company.

Presto-matic is a semi-automatic truck transmission system that takes the effort out of driving by eliminating the clutch pedal — while also providing maximum fuel economy, minimum maintenance and greater safety for driver and equipment.

Write today for free illustrated booklet containing complete information on the operation and advantages of the Spicer Presto-matic Truck Transmission System.

DANA Spicer

DANA CORPORATION • Toledo 1, Ohio

DANA PRODUCTS Serve Many Fields:

AUTOMOTIVE: Transmissions, Universal Joints, Propeller Shafts, Axles, Powr-Lok Differentials, Torque Converters, Gear Boxes, Power Take-Offs, Power Take-Off Joints, Clutches, Frames, Forgings, Stampings.

INDUSTRIAL VEHICLES AND EQUIPMENT: Transmissions, Universal Joints, Propeller Shafts, Axles, Gear Boxes, Clutches, Forgings, Stampings.

AVIATION: Universal Joints, Propeller Shafts, Axles, Gears, Forgings, Stampings.

RAILROAD: Transmissions, Universal Joints, Propeller Shafts, Generator Drives, Rail Car Drives, Pressed Steel Parts, Traction Motor Drives, Forgings, Stampings.

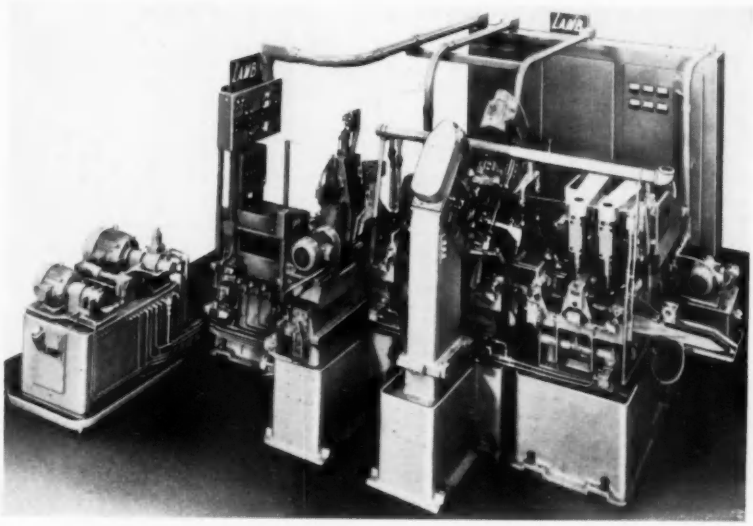
AGRICULTURE: Universal Joints, Propeller Shafts, Axles, Power Take-Offs, Power Take-Off Joints, Clutches, Forgings, Stampings.

MARINE: Universal Joints, Propeller Shafts, Gear Boxes, Forgings, Stampings.

Many of these products manufactured in Canada by Hayes Steel Products Limited, Merritton, Ontario.

Circle 118 on Inquiry Card, for more Data

NEW PRODUCTION and PLANT EQUIPMENT



F. Jos. Lamb piston machine produces 400 parts per hour

Piston Machine Handles Three Different Size Pistons

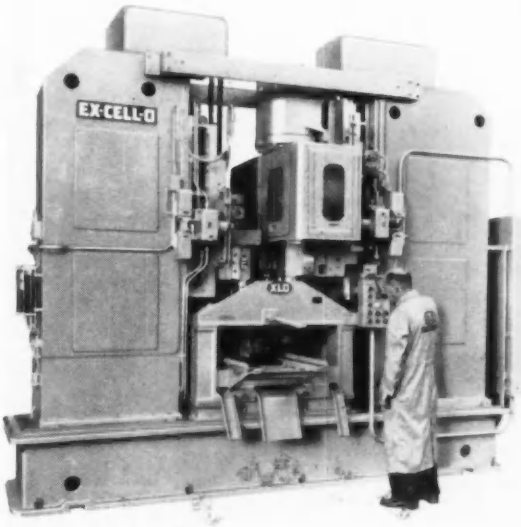
HIGH production and flexibility of use are features of an automotive piston machine produced by *F. Jos. Lamb Co.*

The 10-station machine handles three different size pistons, machines 400 parts per hour and is arranged so that additional operations can be added between any of the three main sections of the machine. Functions performed are: load, orient, rough bore the wrist pin holes, drill oil holes in wrist pin bores, probe drilled holes, saw smoke slots.

Machine operation is completely automatic. Parts are chute fed dome down to the load station from where they are transferred to the orienting station. An orienting head rotates the parts 180 degrees into alignment. Orientation is maintained the length of the machine by two guide rods which straddle the skirt extensions. Circular jaws clamp the parts at the machining stations and a walking beam type transfer mechanism moves the parts through the machine.

Circle 49 on postcard for more data

Vertical Precision Boring Machine



Two custom vertical precision boring machines have been designed by Ex-Cell-O Corp. Each machine is capable of rough and finish boring and chamfering as many as nine holes, ranging in size from 3/8 in. diameter to 5 3/8 in. diameter, in one pass. The machine base and standard columns are of heavy construction. Standard, hydraulically operated vertical slides carry standard boring spindles, mounted in clusters. The design permits ease of maintenance and provides flexibility for changes in product design. Bore sizes are held as close as ± 0.0005 in., locations within ± 0.0015 in.

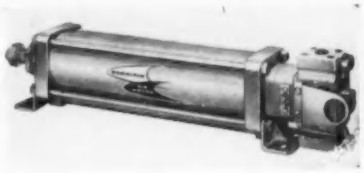
Circle 50 on postcard for more data

Air Power Package

A COMBINATION of air power cylinder and electrically actuated control valve with built-in speed controls has been announced by Hannifin Co., a Div. of Parker-Hannifin Corp.

Named the Hannifin Air Motor, the unit combines all three basic components in a single air power package. Installation requires only one air line connection and simplified wiring to the solenoid-actuated, pilot-operated valve.

The square-head cylinder has a rust-proof body, and an induction case hardened piston rod with hard chromium plated finish. The control valve is of a reciprocating disk design that will operate even when the valve is blanketed by chips or grinder dust, or when splashed with



Hannifin air power package

coolant. Speed controls are built into the 4-way valve port plate and provide adjustment of cylinder piston speed in both directions.

Circle 51 on postcard for more data

Power Take-Off

A SPLIT shaft power take-off capable of transmitting full engine power to operate accessory equipment has been developed by Waterous Co.

The full-torque, direct-drive unit features rigid alignment, and gear spacing is maintained by integral machining of single splitter and take-off

Waterous split shaft power take-off

case. Standard models are available with PTO speeds of from 49 to 204 per cent of input.

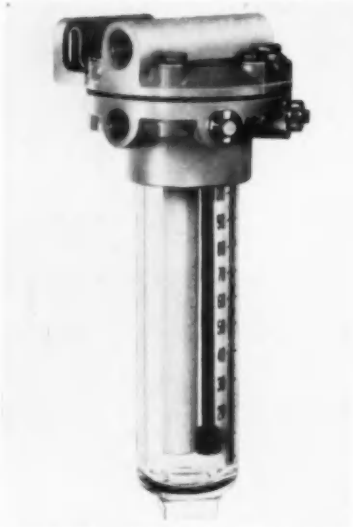
Circle 52 on postcard for more data

(Turn to page 52, please)

Liquid Chemical Feeder

FISCHER & Porter Co. has introduced a liquid chemical feeder, known as the Micro-H, that accurately meters, regulates, and feeds liquid chemicals continuously at extreme low flow rates from 0.0 to 4.0 gallons per day into a liquid stream.

Semi-automatic, the device features a built-in ejector, a corrosion-proof



Fischer & Porter liquid chemical feeder

plastic body, and a porous stone to feed the liquid chemical. The chemical must be free of solids and should possess sufficient transparency.

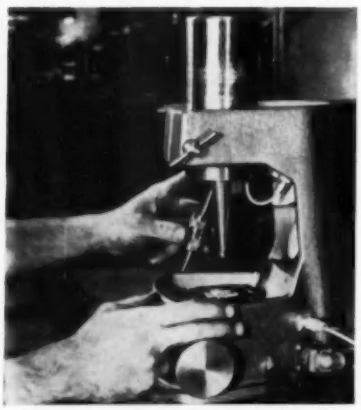
Circle 53 on postcard for more data

Air-Powered Hydraulic Laboratory Press

The Elmes "Hydrolair" is a small, compact, air-powered hydraulic press used for laboratory testing and research work in plastics molding, as well as for certain types small-production in the in the plastics and rubber fields. One of the outstanding features of the press is its operating economy. It is equipped with a special air-hydraulic intensifier which enables the press to take its power right from the regular shop airline or from a small air compressor. (American Steel Foundries, Elmes Engineering Div.)

Circle 55 on postcard for more data

Ultrasonic Impact Drill



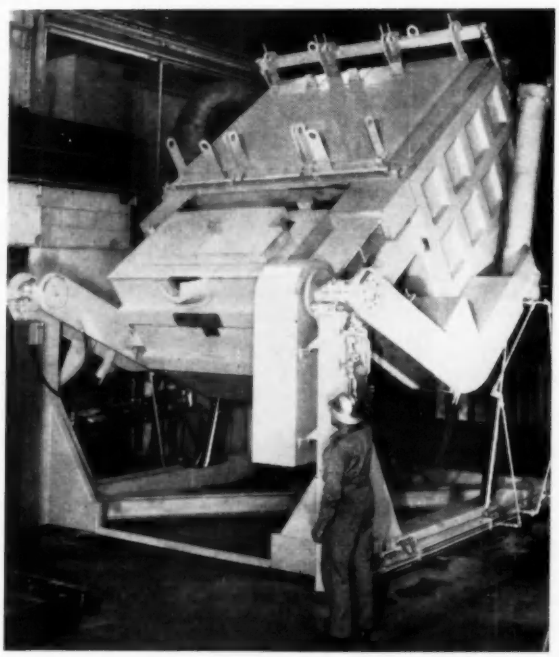
Pictured is a Glennite ultrasonic impact-drill which frees the operator from constant adjustments by use of an automatic tuning control system. The unit drills, slices, engraves, shapes, taps, broaches, dices, shaves, trepans and machines many type of material. (Gulton Industries, Inc.)

Circle 54 on postcard for more data

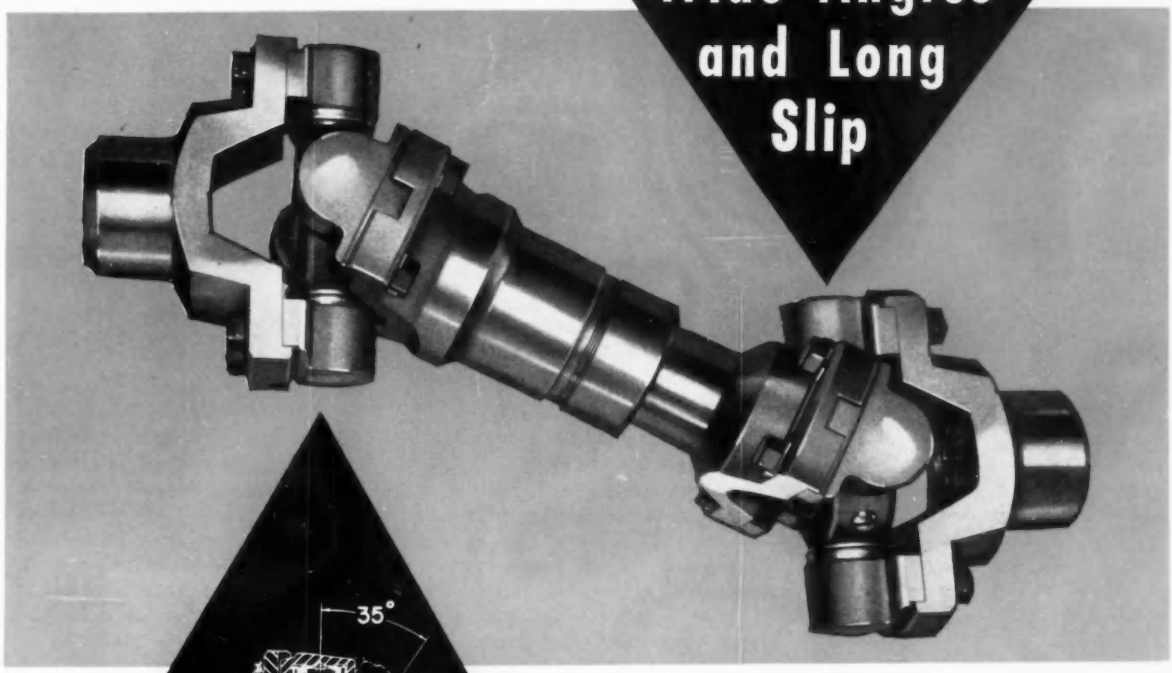
Aluminum Induction Holding Furnace

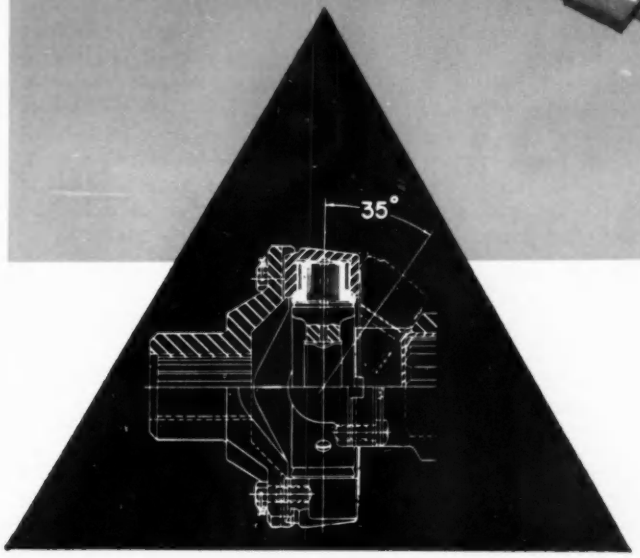
This 30,000 lb aluminum induction holding furnace with a 3-section hydraulically operated cover has been ruggedly constructed for continuous service. The shell is mounted on heavy duty bearing trunnions and supported on heavy structural steel legs. Chamber lining is of monolithic construction and is non-wettable to aluminum. Tilting mechanism is engineered to give positive, safe, fingertip control and the pouring lip is located in the axis of tilting providing a constant pouring arc regardless of the furnace tilt. Ladles or molds need not be shifted during pouring. (Lindberg Engineering Co.)

Circle 56 on postcard for more data



Wide Angles and Long Slip





Problems Are Solved By

MECHANICS
Roller Bearing
UNIVERSAL JOINTS

For Cars, Trucks, Tractors, Farm Implements, Road Machinery, Industrial Equipment, Aircraft

Designers with JOINT problems have learned to rely on MECHANICS. In the road building and agricultural fields, for example—where joints must run all day at constant angles up to 45°—where there are severe shock loads—where wide angles *and* long slip are common—and where dirt and/or moisture are continually present—MECHANICS Roller Bearing UNIVERSAL JOINTS are the accepted solution. Lifetime or once-a-season lubrication is so tightly sealed in that dirt and moisture cannot enter. If you have a "tough" joint problem, it will pay you to make use of MECHANICS engineers' wide experience in solving power transmission problems in hundreds of different fields.

MECHANICS UNIVERSAL JOINT DIVISION
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36 So. Wabash, Chicago 3, Illinois

Heat Treating in Automotive and Aircraft Fields

(*Continued from page* 27)

hearth on which the work is placed. A baffle is usually suspended in the furnace between the charge and discharge positions.

1—ELECTRICALLY HEATED—used where atmosphere control is critical, as in heating gears, cylinder barrels, and other miscellaneous steel parts in endothermic type atmosphere for hardening.

2—DIRECT GAS-FIRED—used where atmosphere control is not considered essential, as in heating steel billets for forging and for preheating iron sprockets prior to flame hardening. However, there are many rotary hearth furnaces indirectly heated by means of radiant tubes where controlled atmosphere of the exothermic and endothermic types is employed. They are used to heat gears, spline shafts, and small parts.

Screw Conveyor

The conveyors on this type of equipment consist of two or more alloy screws located in troughs in the furnace hearth. Work is placed between the leads of two or more adjacent conveying screws. As the screws are rotated, it is conveyed through the furnace.

This type of furnace has been furnished direct gas-fired for heating bar stock prior to forming into coil springs and quenching for hardening. It is used with forced circulation for drawing transmission drive shafts after hardening. There are also many screw conveyor furnaces of the radiant-tube-heated type for the heating of bar stock, drive shafts, etc.

Induction

An induction furnace is actually a form of induction heating, which will be discussed in greater detail in Part III of this article. The term, as commonly used in the melting furnace field, refers to equipment for melting special alloy steels, copper, and aluminum. The container for the molten metal is usually a ceramic crucible with an electric coil wound around the outside. As power is passed through the coil, it creates a magnetic field which generates electric currents in the metal to be melted in the crucible. In the larger field of induction heating for hardening, heat treating, forging, metal joining, etc., the principle of using induced currents to heat the material is employed with processing equipments.

BATCH TYPES

Car

Electrically heated car type furnaces are single or double end using forced circulation units. The work is loaded on a car which is moved into the furnace on tracks set in the furnace foundations. Major uses include heating aluminum and magnesium alloys for forging, homogenizing, and aging. High temperature applications of electric car type furnaces use atmosphere for annealing and normalizing of steels.

Direct-fired car type furnaces are used for drawing large steel assemblies, while fuel-fired radiant tube heated units are employed for aging aluminum forgings.

Bell

This type of furnace consists of a refractory lined bell in which are located burners or other heating elements. The charge is loaded on a refractory base and generally covered by a heat-resisting alloy retort which is supplied with special protective atmosphere. After the retort is purged of all air, the bell is lowered over the charge and allowed to rest on the refractory base. When the heating cycle is completed, the bell is lifted off the base and placed over a new charge on a second base.

Generally, three bases are employed for each bell. While the charge on one base is being heated, the charge on the second base is cooling in protective atmosphere. At the same time, the third base is being unloaded and a new charge placed in position.

This equipment is widely used for annealing coils of steel strip or wire, although other special applications are made in the steel and non-ferrous industries. Bell furnaces are sold more frequently to automotive suppliers than they are to the industry direct.

Box

Two basic types of box furnaces are used most frequently in automotive manufacturing. Those incorporating an integral quench are used for hardening, carburizing, and carbonitriding steel; splines and gears typify applications. Generally of the *fuel-fired radiant tube* type with forced convection, they operate in a temperature range of 1350 to 1700 F with an endothermic atmosphere. Operation is manual, and quench tank is built at front or rear so that the material may be quenched without exposure to air.

The *box-type draw* furnace is a companion equipment and is used for drawing or tempering hardened material from the box furnace described above. Electric or gas-fired, it operates with forced convection in a temperature range of 500 to 1200 F in an air or lean exothermic atmosphere.

Vertical Cylindrical

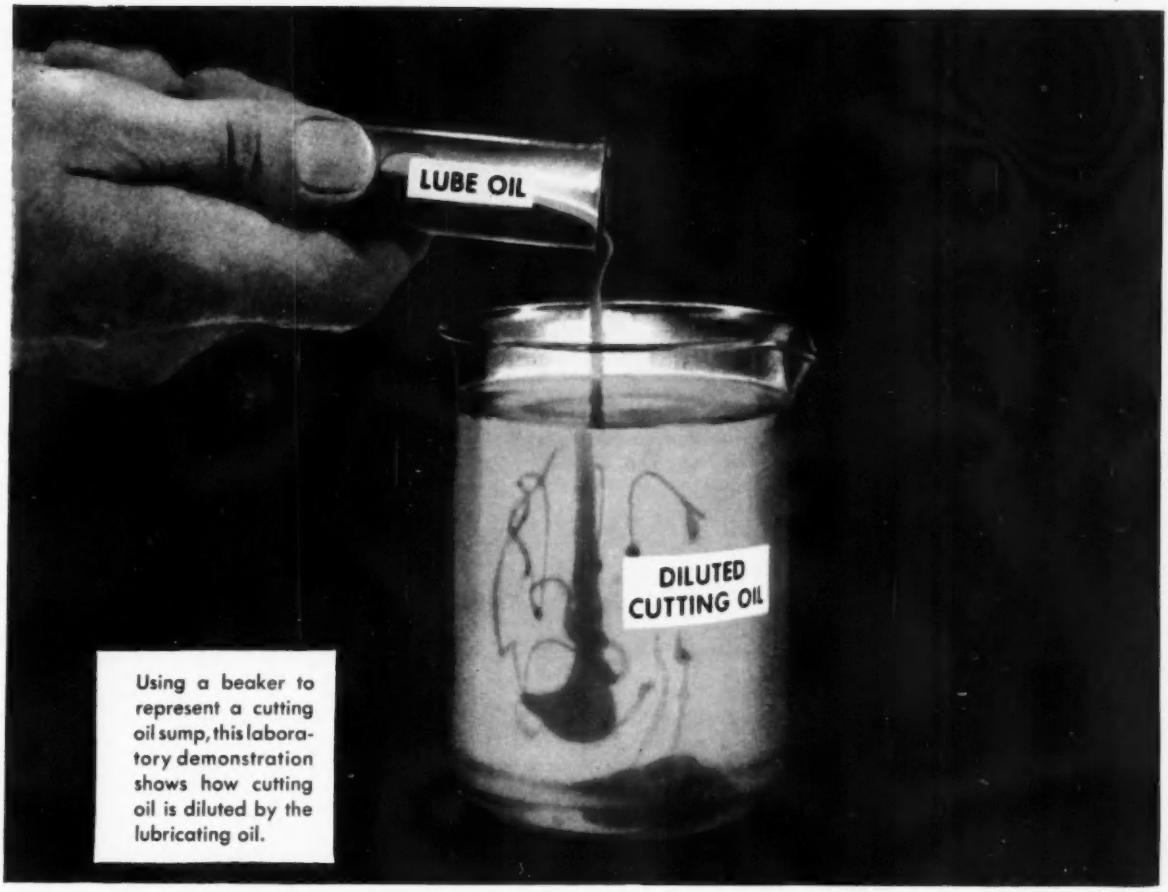
Most gas carburizing in the automotive industry is carried out in pusher tray furnaces described previously. The process is the same in the vertical cylindrical furnace, except that it is entirely a batch type, while the pusher tray equipment is a semi-continuous unit.

The vertical cylindrical furnace as used in the automotive industry is for special gears and splines which require a deeper penetration of carburization than is normally obtained in the pusher type. Production in the former type is not nearly so great as in the latter and is limited primarily to those parts which require a rather deep case.

Salt Baths

The term "salt bath" means a bath compounded by melting one or more chemical salts to form a liquid medium for immersion of the material to be treated. The chemi-

(*Turn to page* 70, *please*)



Using a beaker to represent a cutting oil sump, this laboratory demonstration shows how cutting oil is diluted by the lubricating oil.

Diluted cutting oil can cut output 33%

No matter how careful your lubricating techniques, you still can't stop lube oil from leaking into the cutting oil sump on 70% of automatic screw machines. As cutting oil is diluted, it loses strength—ingredients that make it efficient become less and less effective. The natural consequence is shortened tool life, more downtime and a higher percentage of rejects.

Texaco Cleartex can end this problem forever. All you have to do is use Cleartex for both cutting *and* lubrication . . . and watch your production rise. The exceptional chemical stability and load-carrying ability of the Cleartex series make them equally suitable for use as cutting oils, lubricants and hydraulic fluids. (70% of all automatic screw machines can benefit from the "Cleartex Cure!")

TAKE THE CLEARTEX CURE SOON!

Write today for your copy of Texaco's new booklet—"Cleartex in Automatic Screw Machines." This new illustrated guide will fill you in on the details, show you where you may be losing profits and how to avoid it . . . Or contact your local Texaco Lubrication Engineer soon for an authoritative survey of your automatics. Just call the nearest of more than 2,000 Texaco Distributing Plants, or write to The Texas Company, 135 East 42nd Street, New York 17, New York. Dept. AI-11.

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Aircraft Type Relay

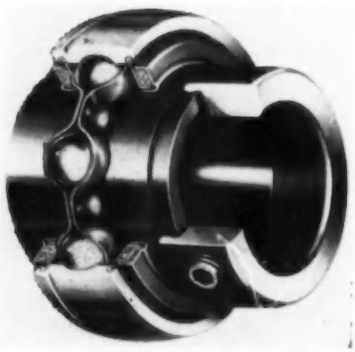
"Diamond H" series R/S miniature, hermetically sealed aircraft type relays are available with AN type connector mounting arrangements for use in missiles, ground and airborne computers, jet engine controls, automation control systems, and similar applications requiring utmost reliability.

The mounting arrangement makes wiring assembly installation and field service simple, while the connector provides a seal against moisture and assures positive connection. The relays can be obtained with a separately sealed coil within the hermetically sealed case and a completely inorganic switch to provide maximum reliability in dry circuit applications. *The Hart Mfg. Co.*

Circle 80 on postcard for more data

Ball Bearings

Eccentric collar lock machine unit ball bearings—equipped either with spherical seat for automatic self-alignment or straight outer diameters



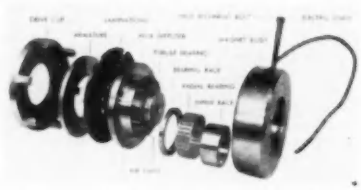
for more rigid, accurate shaft location have been designed by *Hoover Ball and Bearing Co.*

The units were designed for easy adaptation to all types of housings requiring self-contained ball bearings, and are available in 32 shaft sizes from ¾ to 2-15/16 in.

Circle 81 on postcard for more data

Magnetic Clutch

This stationary-field magnetic clutch is said to eliminate the need for maintenance in machine transmissions. The clutches also permit reductions in the size of machine



tool transmissions. They can be placed in a machine drive box or transmission and forgotten because there are no air gap adjustments to be made, no slip rings and brushes to be cleaned, adjusted or replaced.

Applications for the clutches in the machine tool field include speed-changing, feed drives, brakes and couplings in drive systems of lathes, boring mills, planers, milling machines and grinders.

Designated EC-S, the series includes five sizes with torque ratings ranging from 14 through 290 lb-ft. They are available from stock for standard 24 or 90 volt d-c operation. Other control voltages are obtainable on request. *I-T-E Circuit Breaker Co.*

Circle 82 on postcard for more data

High-Strength Nut

A lightweight, high-strength self-locking nut for use at elevated temperatures up to 900 F has been developed by Standard Pressed Steel Co.

Named FN 920, the nut has a tensile strength of 200,000 psi at room temperature and 150,000 psi at 900 F. It is designed for use with high-strength aircraft engine bolts having 0.003 in. reduced pitch diameter. On bolts of this type the FN 920 maintains locking strength after repeated re-use at temperatures up to 900 F. Squareness is held to within 0.003 in., giving close control of the relation of nut bearing surface to threads. They meet the requirements of MIL-N-7873.

Circle 83 on postcard for more data

Pushbutton Actuator

A series of pushbutton actuators for use with a wide variety of basic switches has been introduced by MicroSwitch, a Div. of Minneapolis-Honeywell Regulator Co.

The "12MA" series includes ½ in. and 1 in. button sizes available in red, green or black plastic. Buttons operate in precision-machined anodized aluminum bushings.

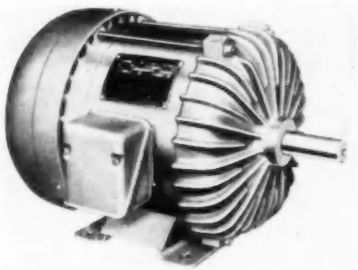
The actuators fit all pin-plunger basic switches, "1TB" and "41TB" switches, made by MicroSwitch. Two sets of screws, nuts and lockwashers for attaching the various basic switches are furnished with each actuator. Both button sizes fit panels from 0.060 to 0.312 in. thick.

Circle 84 on postcard for more data

Single Phase Motors

Available in two, four and six pole speeds, a line of single-phase motors in totally-enclosed fan cooled explosion-proof frames, is built in re-rated NEMA frames 182, 184, 213 and 215. Ratings range from ¾ to 5 hp.

The motors are equipped with double-width, fully sealed, pre-lubricated



ball bearings which retain the lubricant and at the same time seal out dirt and dust. *Robbins & Myers, Inc., Motor Div.*

Circle 85 on postcard for more data

(*Turn to page* 58, *please*)

STRENGTH AND UNIFORMITY are outstanding characteristics of the automotive ball-joint bearings shown below. These sintered metal parts demonstrate Moraine Products' capabilities in working with customers to develop the most practical designs. They also demonstrate Moraine Products' responsibilities—making economically, and in quantity, parts that must not fail under the most rugged operating conditions.

Parts shown ½ actual size.

Vital parts for automotive progress

Moraine Products
Division of General Motors, Dayton, Ohio

Blind Rivet

The Imex rivet is highly resistant to vibration and can be set with standard tools used for "Pop" rivets. It remains air and water tight at pressures as high as 500 psi.

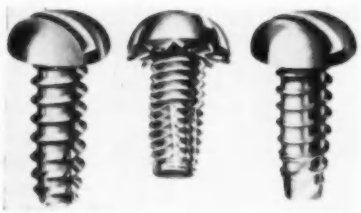
It is set by pulling a mandrel into the rivet shank, spreading and setting it. Radian expansion of the shank is balanced with shear strength criteria to ensure tightness under conditions of excessive vibration.

Sealing is obtained automatically when set. The head of the mandrel is encased within the rivet and seats tightly against a shoulder formed during the setting operation. The Imex rivet is made in 0.125 and 0.187 in. diameters in aluminum. *Pop Rivet Div., United Shoe Machinery Corp.*

Circle 86 on postcard for more data

Thread-Cutting Screws

The five cutting flutes on the improved P-K type "F" and "B-F" thread cutting screws reduce pressure development by 80 per cent, it is claimed. The completely formed threads on these tapping screws have sharp cutting edges, and five deep flutes that are of continuous depth.



These features are said to make for better clearance of the accumulated material and assure minimum stresses in driving, and avoid the possibility of stripping or galling. *Parker-Kalon*

Circle 87 on postcard for more data

Turbine Flowmeters

A line of completely redesigned turbine flowmeters is available from the Cox Instruments Div. of George L. Nankervis Co. to handle jet fuel, gasoline, oil, water, acid and alkali chemicals and other liquids. The meters measure liquid flow with ± ½ per cent accuracy at pressures up to 5000 psi and temperatures from —445 to 1000 F, viscosity permitting.

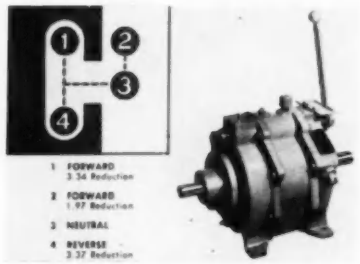
Linear flow ranges are available up to 35:1 depending on flow meter size.

Circle 88 on postcard for more data

Reversing Transmission

The Industrial Div. of The Snow-Nabstedt Gear Corp. has designed a 5 in 1 reversing transmission for application in material handling, machine tool and construction equipment.

Two forward speeds, neutral, reverse and reduction are combined into



a single, compact unit that reverses smoothly under a full load. Designated the S-N Model #5231, the unit transmits up to 28 hp, at a maximum recommended input speed of 2000 rpm. The reduction ratio is 1.97 to 1 and 3.34 to 1 in forward speeds and 3.37 to 1 in reverse. It was designed to meet the demand for a small single unit for many industrial applications and measures 15-11/16 in. long, 14 in. wide and 14-¾ in high.

Circle 89 on postcard for more data

Dial Speed Control

An electric control system is available to provide remote control of U. S. Varidrive variable speed motors. Designated Varitrol-electric type, this control may be located any distance from the motor. It will also permit the operator to pre-set the speed of the drive before starting.

The motor consists of: an operator's station with graduated speed control dial and start, stop and emergency pushbutton; a control unit which houses the control components required; and the electric actuator motor and shifting mechanism which cause the motor to change speed. *U. S. Electrical Motors, Inc.*

Circle 90 on postcard for more data

Traction Equalizer

The transmission and Axle Div. of Rockwell-Standard Corp. has announced the development of a traction-improving device for use on both off and over the highway units. It imparts to the wheel with the best road adhesion a substantial increase in tractive effort. It will propel a vehicle even if one of the driving wheels is completely off the ground, it is said.

Circle 91 on postcard for more data

Copper Finish

A copper finish that assures uniform coverage by all types of acid resist tanks without further surface preparation has been developed by Taylor Fibre Co. for all of its copper-clad laminated plastics.

The finish also permits good solder buildup and coverage, making soldering easier and soldered connections more secure.

Circle 92 on postcard for more data

Isolated Power Supply

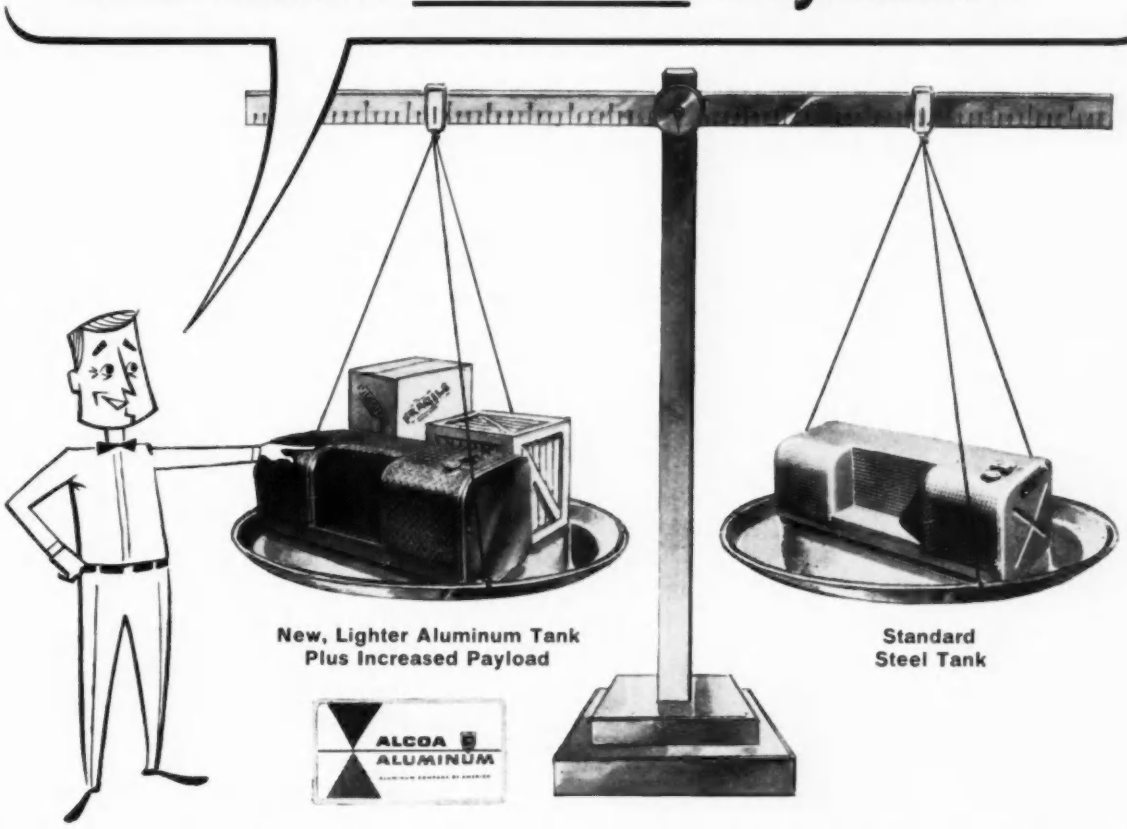
This power supply provides an output isolated from line voltage and line ground. Absolute isolation is approached through the use of a specially shielded transformer and feedback isolation circuits. The unit provides 0 to 20 volts at one amp

regulated d-c power by means of transistorized circuitry.

The supply is portable and, in addition, is suitable for rack-mounting (three supplies per standard rack). Its dimensions are 7 by 9 by 14 in. *Moeller Instrument Co.*

Circle 93 on postcard for more data

New *SNYDER* Aluminum Tanks Will Allow Increased Payloads !



Snyder Center-Step Tanks illustrated here each have a capacity of 70 gallons. The steel tank weighs 153 lbs., the aluminum, 72 lbs. With a dual aluminum tank installation your trucks can carry 162 lbs. more payload – every trip !

And when you buy Snyder you get a quality engineered, proven product . . . fully guaranteed!

Snyder has more experience than any other tank manufacturer in designing and building aluminum tanks. More and more truck manufacturers are accepting them for original equipment installation for these reasons.

All Snyder Aluminum Tanks are built of Alcoa Aluminum, are carefully tested, and meet all I.C.C. requirements for gasoline or diesel use.

Because they are corrosion-resistant, they never need to be painted. And because they *can't* spark, they're extra safe for use with highly volatile gasoline.

It has been established that less sludge forms when diesel fuel is carried in *aluminum* tanks. This means less frequent cleaning and reduced maintenance costs.

Snyder Aluminum Tanks are now in regular production. You can select from 12 models of aluminum Cylinder Tanks with capacities from 37 to 72 gallons or from 4 models of aluminum Center-Step Tanks with capacities from 44 to 70 gallons. For all their advantages, isn't it time you considered aluminum tanks? For complete information, write or phone Mr. Richard Kryder, Sales Manager.

For safety, satisfaction and service, be sure to:

ALWAYS SPECIFY

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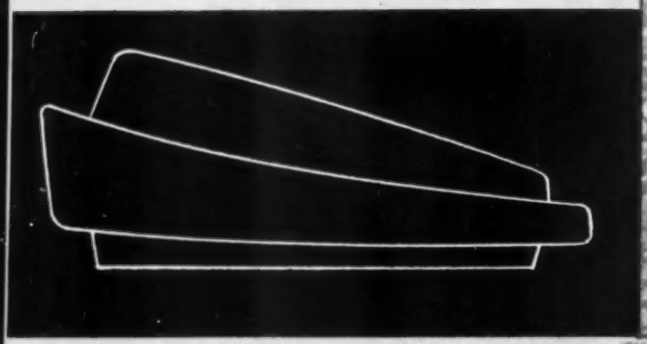
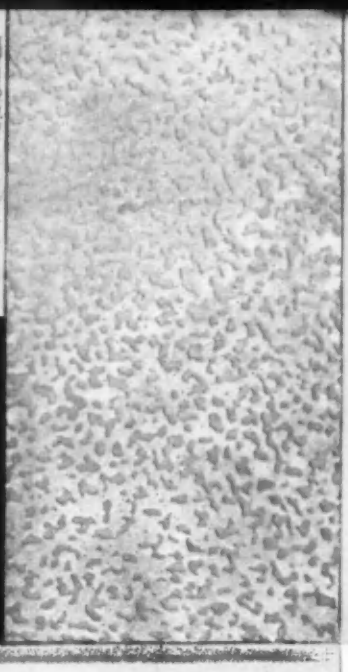
Circle 123 on Inquiry Card, for more Data ⟶





Peter Schladermundt, A.I.A., A.S.I.D., P.D.C., for 25 years a leading designer of many of America's foremost industrial products. Formerly associated with Norman Bel Geddes and other designers and architects on such projects as General Motors "FUTURAMA" and the design of Rockefeller Centre. Presently heading his own firm specializing in all types of design service to industry. Recently designed the Trade Fairs for the United States Government Department of Commerce in Milan and Paris.

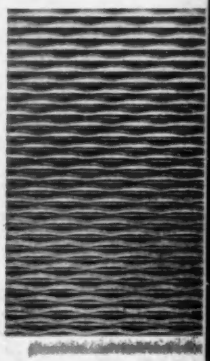
Peter Schladermundt and Sharonart combine for a new design concept....

Tomorrow's business machines will have the low, sleek profile and functional beauty you see in this typewriter design created by the nationally known industrial designer Peter Schladermundt especially for the Sharon Steel Corporation.

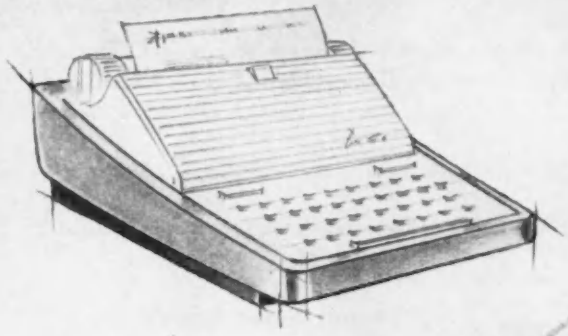
Gone is the bothersome cloth cover and in its stead a regular built-in secretarial workshop that includes typewriter accessory and lighted shorthand book and note compartments. And when the day is through the desk area is made neat by simply dropping the attractive machine lid.

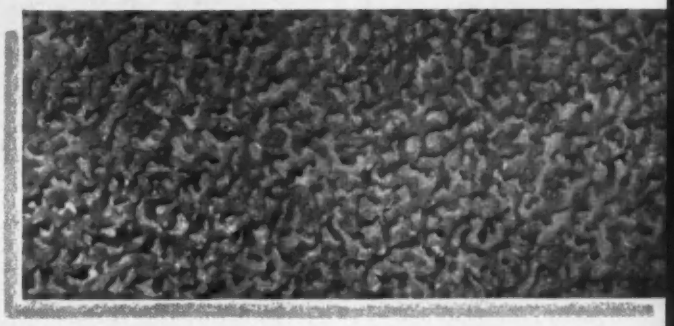
Ingenious? Yes, but perhaps the most important aspect of the design is the functional use of Sharonart, Sharon's popular patterned steel. By fashioning the work areas of Sharonart the usual marks of wear never show, and by forming the cover of this amazing metal many styles are immediately available to the manufacturer by simply changing the pattern . . . and here, too, wear is practically eliminated.

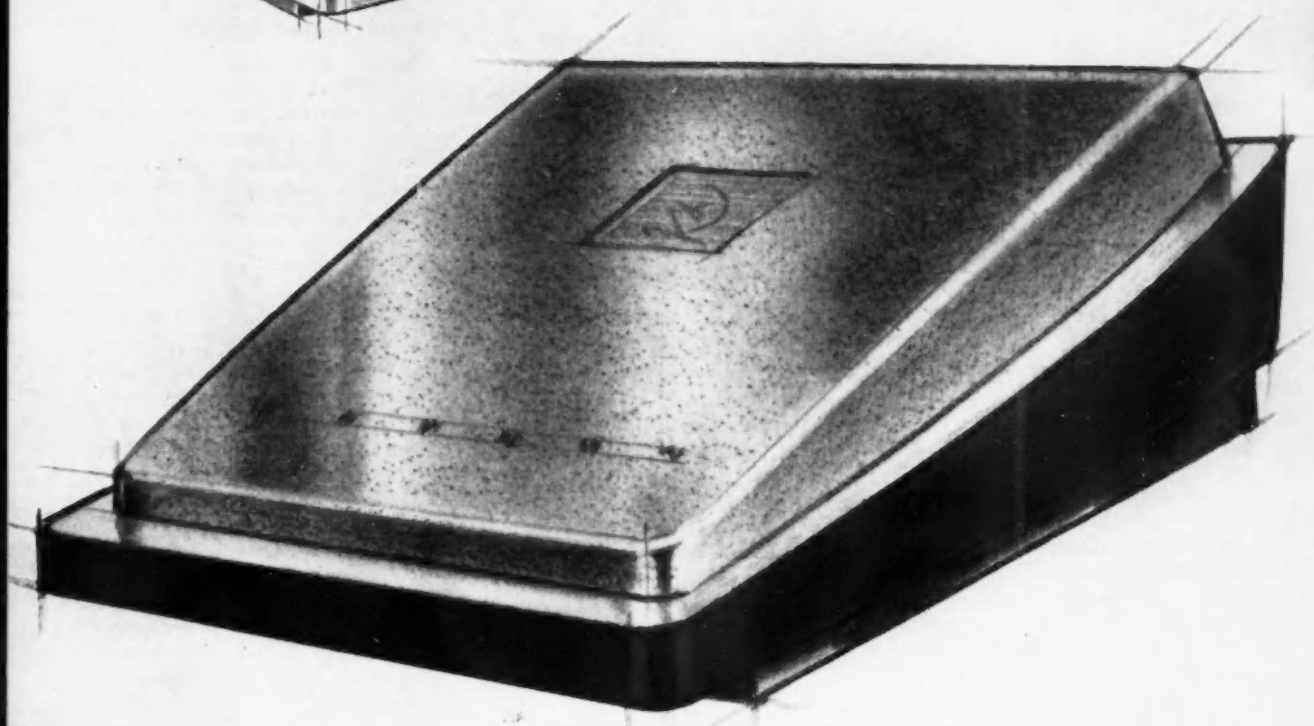
It's the kind of forward thinking that has made Sharonart the most popular material of its kind. Literature and information available from the Sharon salesman in your area or by writing direct to *Sharon Steel Corporation, Sharon Pa.*

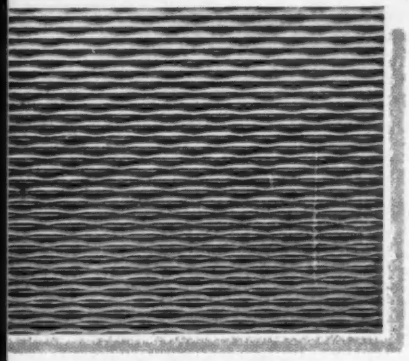


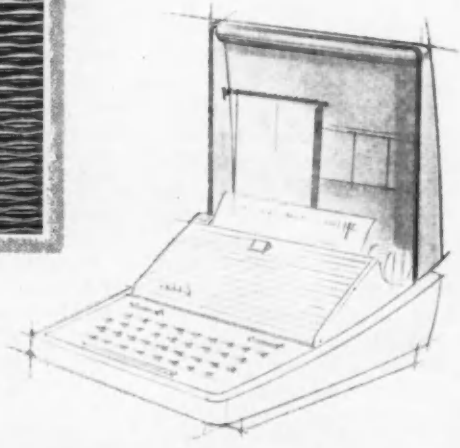
SHARONSTEEL **SHARON** *Quality* **STEEL**

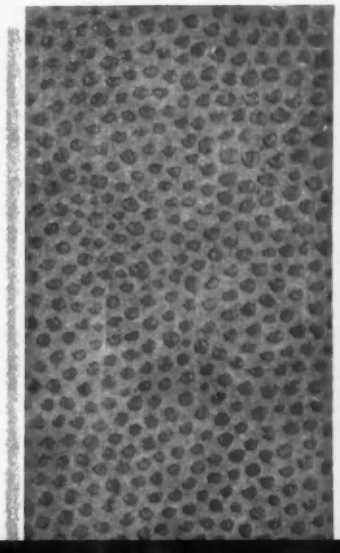












METALS

Every Division of Steel Industry Reports Record Business. Copper Sales Heavy, Aluminum Demand Good, Zinc Price Cut

By William F. Boericke

Steel Output At Record Rate

By mid-March it appeared that the month would set all-time records for steel output. The first week in March the producers turned out 2,562,000 tons of ingots and castings while operating at 90.5 per cent of capacity. This set a new high, surpassing the best previous week in December, 1956.

Nevertheless demand is so heavy that many producers are receiving new orders at a rate above capacity as users build stocks in fear of a strike. Consumers are striving frantically to get firm commitments from the mills for delivery before June 30. It appears that some steel mills have taken on more business than they can possibly deliver before that date. In consequence there may be many carryovers accumulating over the next few months.

Commenting on the current steel demand, Armco Steel declared in a stockholders' letter there were three major contributing factors: a generally improved economy; much lower steel inventories than a year ago; and definite evidence of advance buying as protection against a possible steel strike. To these may be added a fourth, fear of freight car shortages that would delay deliveries even if the steel were available.

Some Lull Expected In Third Quarter

All this adds to the conclusion that strike or no strike, there will be more than a normal seasonal lull in the third quarter. If there is no work stoppage, customers will draw on inventories that may have been unduly expanded as a hedge against that event. In the meantime every division of the industry reports record business, with flat rolled products in sharpest demand. Delivery time for sheet and strip has lengthened. Galvanizers are booked through the first half of the year and manufacturers of tin plate are similarly placed. Orders for structurals and oil country goods formerly laggard, are now increasing.

Trouble for Late Comers

Late comers into the steel market are having trouble. Some may have to pay warehouse prices for supplies. Some may have to import steel from Europe. Conversion deals are talked about, a costly arrangement that means a lot of cross-hauling and extra handling. The gray market for steel may revive. Shipments of finished steel are reported to be even larger than ingot output.

Scrap in Poor Demand

Electrical and stainless steels are strong. Stainless shipments increased in faster ratio than carbon steel and other alloys even exceeded stainless. Only dealers in steel scrap are singing the blues. They can't understand why a 90 per cent operating rate doesn't spell soaring prices for scrap. There are several explanations. The mills probably had a larger inventory of scrap than suspected. The prospect of a steel strike discourages scrap accumulation. Then too, there has been an increasing use of hot metal in the steel making mix. The mills could do this because they had blast furnace capacity available to turn out extra pig iron. And mills are believed to be receiving a heavy flow of scrap direct from customers.

Copper Sales Heavy

Copper sales were heavy in March. Early in the month Anaconda announced its price would be 31½ cents a pound and its action was immediately followed by the other producers. This brought the producers' price within ½ cent of the custom smelters' quotation who had pushed it up to 32 cents before. By mid-March the smelters had withdrawn from the market, declaring they had no copper to sell. On the outside market dealers were quoting 34 cents a pound.

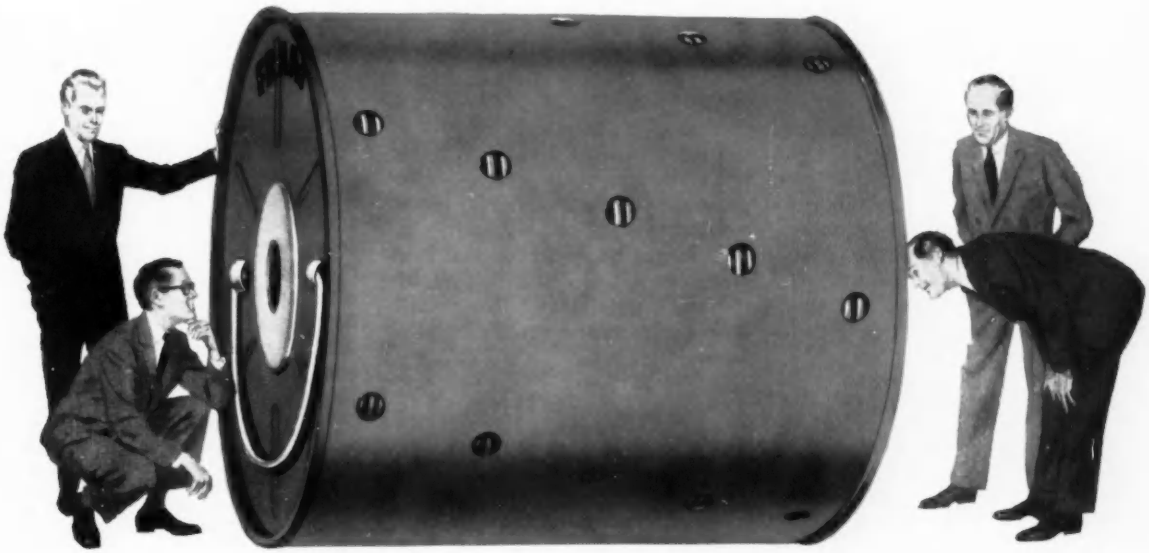
A further increase in the producers' price is probable, although regarded with misgivings by some factors. With aluminum in over supply and producers making every effort to increase sales, there was real danger that a run-a-way copper market would turn consumers away from copper to the competitive metal as they had threatened to do if confronted again with high priced copper.

Hedging Against Strikes This Summer

Nevertheless consumers have been buying copper avidly to replenish inventories and play it safe against work stoppages at the mines when wage negotiations begin this summer. Thus it cannot be definitely asserted that all deliveries went into consumption Yet undoubtedly there was a real pickup and brass mills were generally reporting better business all along the line with higher prices for their products. Scrap copper was in keen demand with the price pushed up to 27½ cents by mid-March. This would indicate about

(*Turn to page* 80, *please*)

Here's where people see eye to eye...



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Report from the FARM EQUIPMENT INDUSTRY

By Kenneth Rose

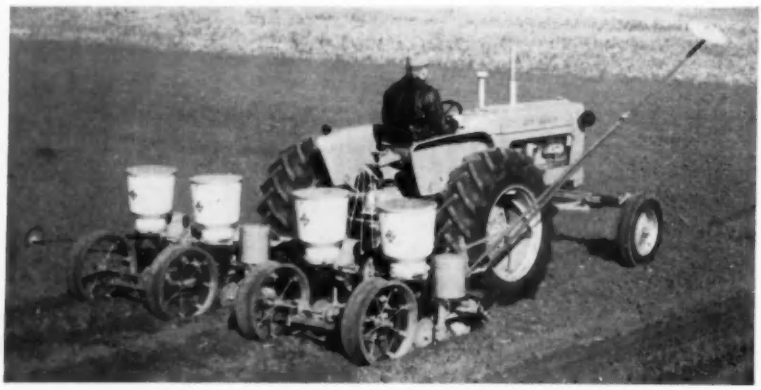
ORDERS for farm equipment are coming in at a rate substantially above that of last year, dealers report. Much of the equipment recently ordered was for the southern states. The severe winter has delayed work in the fields of the northern states, and farmers in these areas have tended to put off their purchases. This sector of the business may be expected to fully materialize soon—and for quick delivery.

Minneapolis-Moline Co. reports an encouraging increase in sales of 13.6 per cent for the first quarter of fiscal 1959, ending January 30, over the sales for the corresponding quarter in 1958 fiscal.

John Deere is embarking upon several expansion programs—one to double the capacity of its manufacturing facility, new last fall, that produces backhoes, loaders, dozers, and other equipment for Deere tractors, the other a $2.8 million program for the foundry to produce nodular iron castings.

The company also has set up factories at Monterrey, Mexico, and at Rosario, Argentina, the latter a temporary plant while permanent facilities are under construction. The company has also bought up, over the past few years, more than 80 per cent of the stock of Heinrich Lanz, AG, West German farm equipment producer.

Oliver Model 660 six-row, front-mounted cultivator has detachable extensions on sides for conversion to four-row unit

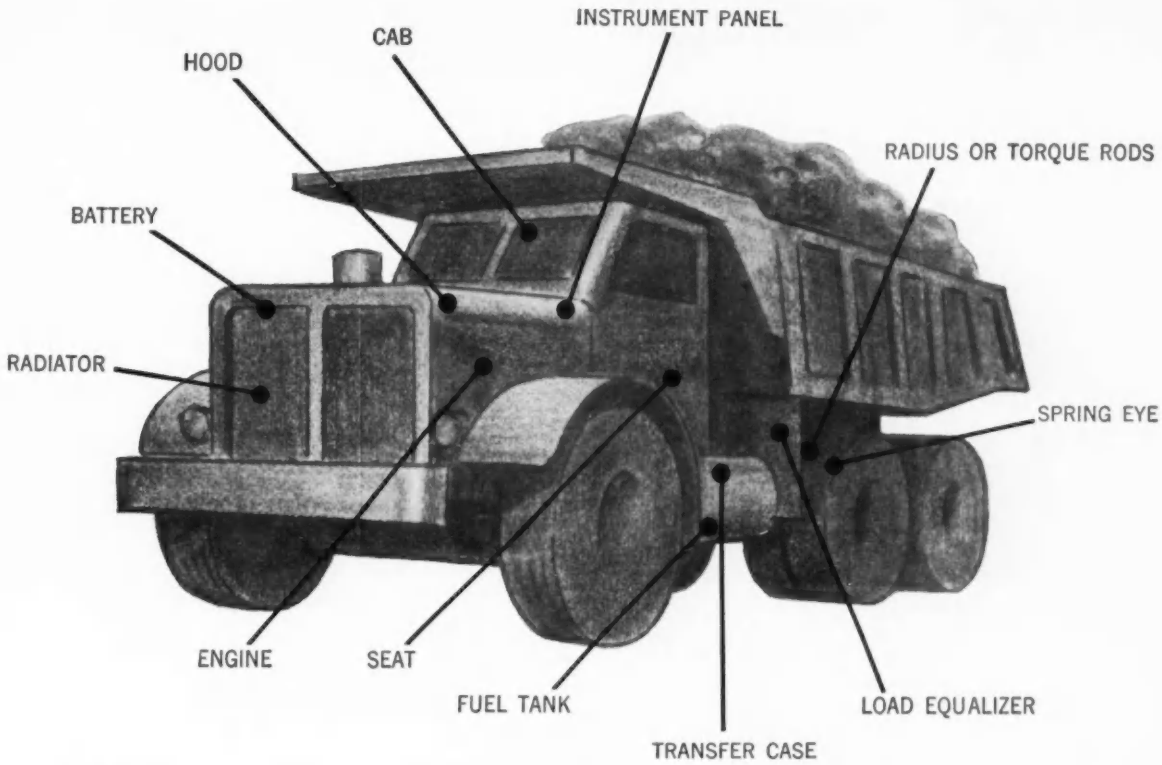


Allis-Chalmers new four-row, rear-mounted drill planter

The newest of the **Oliver Corp.** cultivators is a six-row unit, front-mounted, with a 2¾-in. square tool bar supporting the main frame. Extensions on both sides are detachable to convert the cultivator to a four-row unit. In light soil the cultivator, designated Model 660, can be operated satisfactorily by an Oliver 770 tractor; but for heavy-duty and deep cultivation, the Oliver 880 or Super 88 is recommended.

Oliver's Model 919 sprayer, produced as a complete unit or as an attachment adaptable to most steel or wood tank sprayers having 20-gpm or greater pump capacity and a 300-gal or larger tank, is the company's newest in farm crop control equipment. The spray head has wide rotation range, with 24 hollow cone nozzles and nine blank tips provided to offer a wide variety of discharge rates. A 36-hp engine powers the unit, with direct drive to an eight-blade, 29-in. diam, axial-vane fan.

Allis-Chalmers Mfg. Co. has announced two new two- and four-row drill planters, tractor rear-mounted, which include new fertilizer side band displacement disk openers that permit the operator to place fertilizer accurately below and to one side of the seed. Each seed is ejected individually by a seed plate from the hoppers to give almost any desired spacing in the row. A screw crank regulates planting depth. Row spacings may be adjusted from 28 to 42 in. More than 100 different seed plates are available to plant cotton, corn, beans, peas, sorghums, peanuts, and others. ■



critical points for shock and vibration control

Engineered protection against shock and vibration pays off in *better performance*, *longer service life* and *less maintenance*. This is the experience of a growing number of off-highway, construction and farm equipment manufacturers.

By using flexible LORD Mountings and Joints at key points, they eliminate the efficiency-destroying effects of brutal jolts, vibration, distortion and misalignment.

LORD elastomeric units provide positive cushioned action under severe conditions, outlast metal units and never need lubrication. Tough, service-proved flexing elements are specially compounded elastomers, permanently LORD-bonded to steel members. Design is simple and compact, requires no close tolerances, usually fits existing mating parts.

LORD Mountings and Joints are economical, can be specially engineered by LORD to your specific application. Their use eliminates need for "beefing-up" structures, thus permitting increased payloads.

Take advantage of LORD's unsurpassed experience—contact your nearest LORD Field Engineer or the Home Office, Erie, Pa.

Center Bonded Mountings provide flexible support for components, absorb heavy shock loads, isolate vibration and accommodate relative motion without loss of stability. Also feature high unit load capacity and patented rebound protection. Ask for Bulletin 712.

Dynaflex® Joints are long-lasting, lubrication-free bearings or pivots. They accommodate torsional and angular motion, absorb shock and reduce noise and wear. Ask for Bulletin 713.

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DAYTON, OHIO · BAldwin 4-0351
DETROIT, MICH. · Diamond 1-4340
KANSAS CITY, MO. · WEstport 1-0138
LOS ANGELES, CAL. · HOllywood 4-7593
NEW YORK, N. Y. · Circle 7-3326
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"In Canada—Railway & Power Engineering Corporation Limited"

LORD MANUFACTURING COMPANY • ERIE, PA.

Circle 125 on Inquiry Card, for more Data

• • INDUSTRY STATISTICS • •

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending March 14	Weeks Ending March 7	Year to Date 1959	Year to Date 1958
PASSENGER CAR PRODUCTION				
Total—American Motors	8,518	8,504	61,712	34,872
Chrysler	2,042	1,871	14,007	12,759
De Soto	1,783	1,653	11,480	9,092
Dodge	5,533	5,183	29,613	20,315
Imperial	527	593	4,868	3,731
Plymouth	14,546	12,550	64,906	82,491
Total—Chrysler Corp.	24,431	21,850	123,876	128,388
Edsel	870	885	11,454	3,295
Ford	32,909	31,039	325,793	246,069
Lincoln	722	620	7,470	8,342
Mercury	2,535	3,852	38,431	27,645
Total—Ford Motor Company	37,038	36,396	383,148	285,351
Buick	5,991	7,194	76,561	71,862
Cadillac	3,383	3,384	38,022	32,618
Chevrolet	33,027	34,089	358,602	336,862
Oldsmobile	8,870	9,137	94,900	88,285
Pontiac	8,681	8,651	94,470	66,213
Total—General Motors Corp.	59,952	62,515	662,555	596,840
Total—Studebaker-Packard Corp.	4,380	4,291	40,779	6,555*
Checker Cab	.....	135	1,312	780
Total—Passenger Cars	134,297	133,691	1,293,382	1,052,786
TRUCK AND BUS PRODUCTION				
Chevrolet	7,310	6,671	81,388	61,771
G. M. C.	1,666	1,750	18,751	13,586
Diamond T	140	141	1,443	1,162
Divco	80	70	724	624
Dodge and Fargo	1,845	1,401	18,235	11,473
Ford	6,490	6,161	65,820	51,006
F. W. D.	31	16	229	310
International	3,508	3,320	25,152	23,793
Mack	367	312	3,560	3,090
Studebaker	375	424	3,618	2,224
White	397	381	3,688	4,012
Willys	2,517	2,528	23,612	17,104
Other Trucks	60	60	615	656
Total—Trucks	24,786	23,235	246,835	190,811
Buses	75	55	468	776
Total—Motor Vehicles	159,518	156,981	1,540,685	1,244,373

* Includes Packard.

RETAIL CAR SALES BY PRICE GROUPS*

NUMBER OF CARS

Price Group	December 1958 Units†	December 1958 % of Total	December 1957 Units†	December 1957 % of Total
Under $2,000	6,813	1.42	780	.16
$2,001 to $2,500	106,302	22.12	317,882	64.72
$2,501 to $3,500	325,713	67.79	124,350	25.32
Over $3,500	41,641	8.67	48,148	9.80
Total	480,469	100.00	491,160	100.00

Price Group	Twelve Months 1958 Units†	Twelve Months 1958 % of Total	Twelve Months 1957 Units†	Twelve Months 1957 % of Total
Under $2,000	54,527	1.27	25,172	.43
$2,001 to $2,500	2,382,029	55.60	3,671,784	63.43
$2,501 to $3,500	1,453,546	33.93	1,618,978	27.97
Over $3,500	394,017	9.20	472,648	8.17
Total	4,284,119	100.00	5,788,562	100.00

DOLLAR VOLUME OF SALES

Price Group	December 1958 Dollars	December 1958 % of Total	December 1957 Dollars	December 1957 % of Total
Under $2,000	$ 12,565,494	.94	$ 1,222,260	.09
$2,001 to $2,500	253,863,839	18.99	749,601,205	56.62
$2,501 to $3,500	880,880,262	65.91	358,981,420	27.12
Over $3,500	189,266,024	14.16	214,083,787	16.17
Total	$1,336,575,619	100.00	$1,323,888,672	100.00

Price Group	Twelve Months 1958 Dollars	Twelve Months 1958 % of Total	Twelve Months 1957 Dollars	Twelve Months 1957 % of Total
Under $2,000	$ 98,057,428	.85	$ 44,535,948	.29
$2,001 to $2,500	5,583,762,811	48.65	8,318,411,583	54.62
$2,501 to $3,500	4,048,026,185	35.26	4,585,537,672	30.11
Over $3,500	1,749,885,149	15.24	2,281,590,981	14.98
Total	$11,479,711,573	100.00	$15,230,076,184	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

NEW CAR REGISTRATIONS

Make	January 1959	December 1958	January 1958
Chevrolet	106,543	132,585	104,108
Ford	96,501	123,710	79,804
Oldsmobile	28,108	37,024	29,689
Plymouth	26,533	31,726	32,916
Pontiac	25,489	30,670	21,653
Buick	21,625	32,970	27,309
Rambler	21,037	23,898	8,660
Cadillac	11,911	14,498	10,862
Mercury	11,138	13,848	10,986
Dodge	9,862	11,138	11,668
Studebaker	9,387	9,779	3,523
Chrysler	4,389	4,556	6,270
Edsel	3,610	4,535	5,046
De Soto	3,275	3,692	5,050
Lincoln	2,529	2,841	2,906
Imperial	1,533	1,514	1,997
Miscl. Domestic	238	637	478
Foreign	35,806	37,683	19,335
Total—All Makes	419,512	517,304	382,240

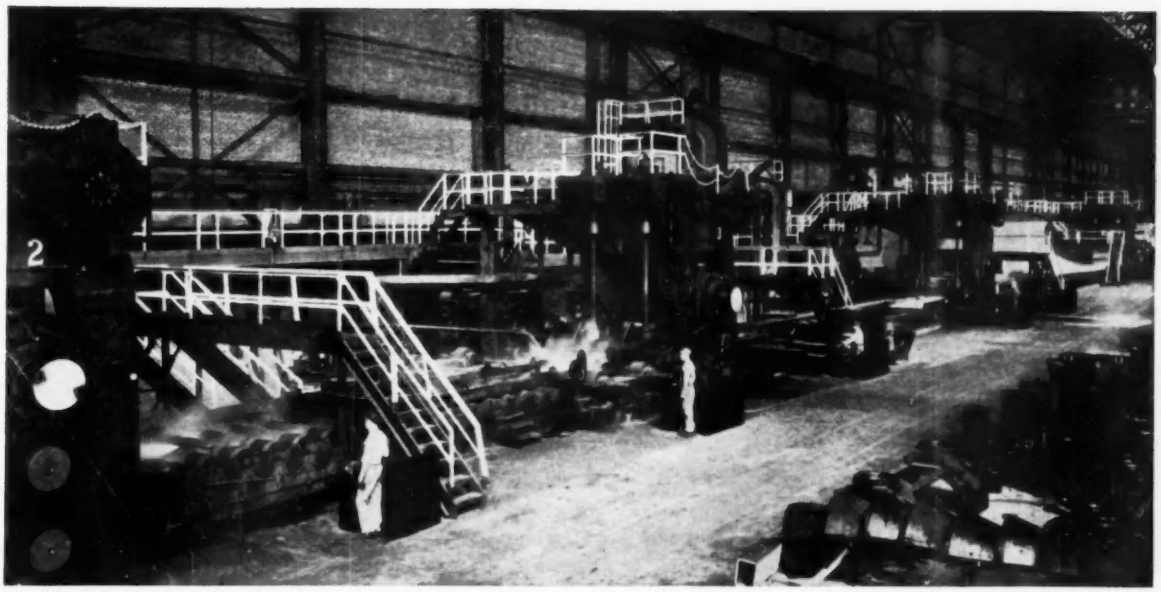
REGISTRATIONS OF FOREIGN CARS

January

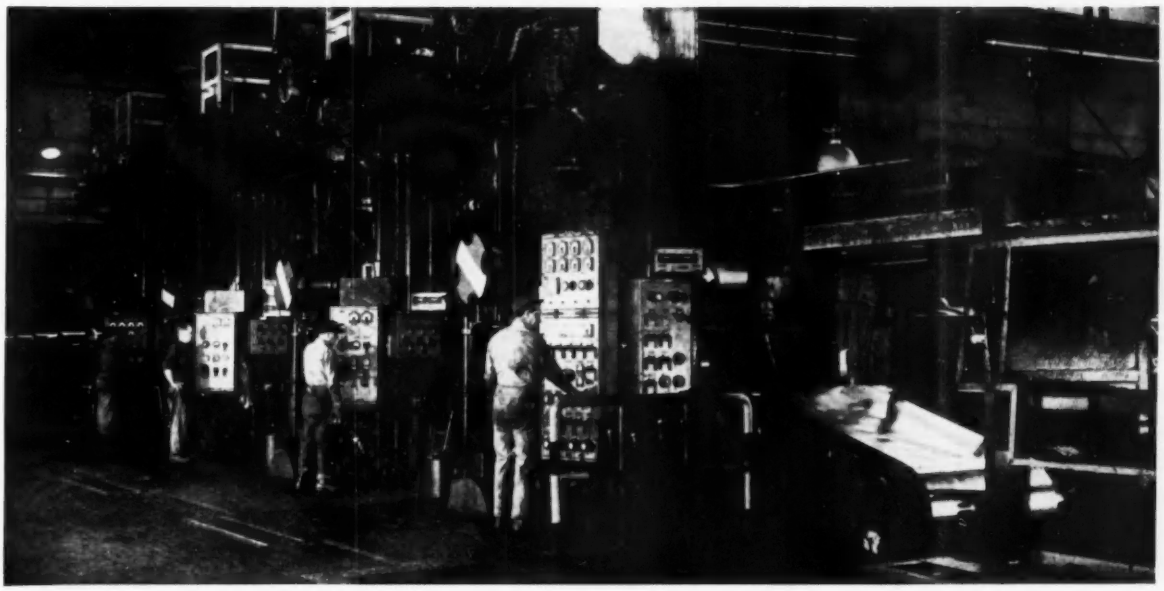
1959		1958	
Volkswagen	6,480	Volkswagen	5,288
Renault	4,757	Renault	2,245
English Ford	2,971	English Ford	1,648
Fiat	2,425	Hillman	988
Simca	2,232	M. G.	863
Opel	2,168	Simca	849
Hillman	1,932	Opel	727
Vauxhall	1,523	Fiat	724
Volvo	1,359	Triumph	685
Triumph	1,283	Metropolitan	647
All Others	8,676	All Others	4,671
Total	35,806	Total	19,335

NEW TRUCK REGISTRATIONS

Make	January 1959	December 1958	January 1958
Chevrolet	23,565	26,571	17,656
Ford	17,373	21,719	14,627
G. M. C.	5,015	5,621	3,929
International	4,853	7,607	7,525
Dodge	3,418	4,176	3,039
Willys Truck	1,371	2,012	976
Mack	991	989	845
White	843	1,041	810
Willys Jeep	628	1,115	419
Studebaker	445	364	390
Diamond T	227	230	193
Brockway	83	108	62
Miscl. Domestic	2,986	3,181	1,931
Total—All Makes	61,798	74,734	52,402



On these giant sheet mills we measure in 000ths



Shown at the top is the 68-in. continuous hot mill at our Sparrows Point, Md., plant. Entering this mill as slabs several inches thick, hot steel whizzes through at ever-increasing speeds until it emerges as hot-rolled sheet at speeds up to 2120 ft per min. The finest hot-rolled sheet steel you can buy!

Some of this hot-rolled steel is further reduced cold at still higher speeds for use in automobile body stampings and a host of other applications. Typical of Bethlehem's up-to-the-minute facilities is the 54-inch cold mill at our Lackawanna, N. Y., plant (lower photo).

Massive though these mills are, experienced operators control thickness tolerances within a very few thousandths of an inch! And all along the line, Bethlehem sheets are carefully checked to insure uniformity of gage, surface, weight and mechanical properties.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Observations

By Joseph Geschelin

Major Change

Hercules Motors is working on the biggest project in its long history. Our readers may know that Hercules recently acquired the engine business of Hall-Scott, and, previously, the aircooled industrial engine line of Lycoming. They are now in the process of revising their entire line, reducing the number of conventional models, eliminating many old models. To this will be added an entirely new line of high-speed, high-performance gasoline and Diesel engines; the big Hall-Scott engines; and small engines. When the shuffle has been completed, Hercules will have a unified line of engines ranging from the smallest to the biggest required in transportation and other industrial uses.

Hard Honer

The hard honer introduced by National Broach sometime ago is rapidly finding its place in the industry. We learned recently that the company has 70 of these machines in regular service in transmission and gear plants. At this writing most of the machines are being employed in repair and salvage operations at the end of the gear line, converting almost certain scrap into very desirable gears.

Turbo-Charger

One of the leading parts makers showed us the design of a new turbocharger for gasoline engines. Intended at the start for truck engines, this unit may also hit passenger car engines as well if it pans out as they hope. It is claimed to increase horsepower by 30 per cent, fuel economy by 10 per cent or more. Biggest surprise is that by employing strictly automotive design and processing, they hope to get the cost down to a very modest figure. Imagine what this could do on a passenger car engine when coupled with a similarly inexpensive fuel injection system.

Product Mixes

According to The Cross Co., the single-purpose transfer machine is giving way to a more versatile concept capable of handling a variety of product designs in mixes or batches. One noteworthy example of this is the transmission case line at the Ford Sharonville plant, where four different cases are handled over a single line occupying only 40 per cent more floor space than one single-purpose line. The Cross concept embodies electrical sensing devices that identify workpieces as they progress along the line. They serve automatically to switch heads in or out of action, as the case may be, on parts with minor variations. Product mixes consisting of parts having major design variations are processed in batches following minor changes in machine setup—repositioning fixtures, changing or removing tools, adjusting machine unit feed dogs, and the like. It all adds up to something that is most helpful not only to plant management but to engineering as well.

Plating Automation

Udylite has just come out with a new idea in barrel processing equipment, employing the VIP conveyor system (variable-integrated-processing). It offers a wide range of operational cycles; integrated in a single self-contained power and control unit. Processing in barrels, oscillating trays or perforated boxes, the unit is capable of handling such operations as cleaning, rinsing, pickling, plating, phosphating, etc. In short, it is an exceedingly versatile machine in a single package.

Progress Hurts

What price progress? Ask a prominent supplier of frames for Chrysler Corp. According to a recent news story, this Detroit area plant is closing down due to the fact that Chrysler will have unitized bodies for 1960. The only thing that's certain in this business is constant change.

Inner-Shield

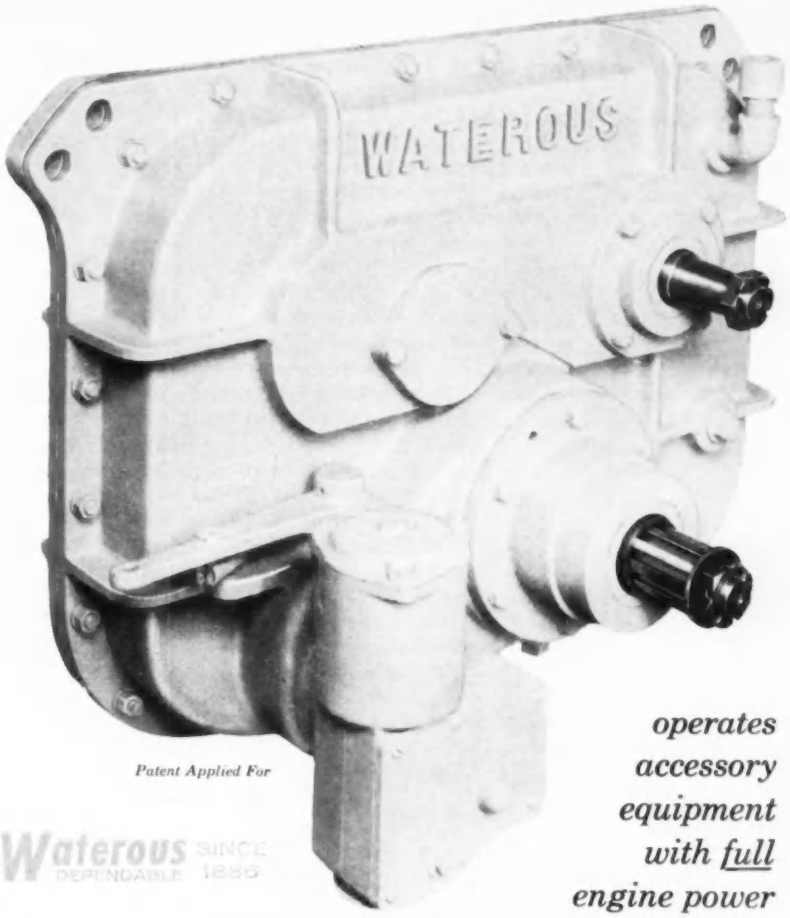
Latest wrinkle from The Lincoln Electric Co. is a new concept of shielded arc welding—Innershield. The secret lies in the use of a cored, bare electrode which supplies its own inert gas shield. One of its most noteworthy applications is in the welding of rear axle housings. The weld is penetrant and clean, requires no clean-up on the interior.

Induction Progress

Tocco has made some major strides recently in a variety of applications of induction heating equipment. A big one is the induction-hardening of camshafts in a fully automated machine cycle. Then they also have a surprise in the form of butt-welding of the ends onto a heavy-duty fabricated rear axle housing.

Flat Grind

Hill Acme, prominent producer of flat sheet grinding equipment, tells us that the next move will be the flat grinding of stainless steel aircraft skins. These big sections cannot be rolled absolutely flat and grinding appears to be the only economical solution. ■



Patent Applied For

Waterous SINCE DEPENDABLE 1885

operates accessory equipment with full engine power

FULL TORQUE, SPLIT-SHAFT POWER TAKE-OFF

New from WATEROUS: transmit full engine power for operating high power accessory equipment—and eliminate the cost, weight, bulk, and hazards of a separate engine.

Rigid alignment and gear spacing is maintained by integral machining of single splitter and take-off case, assuring dependable, quiet, long-life performance.

Wide range of increasing and decreasing gear ratios available together with multiple P.T.O. outlets for installation flexibility. Standard rotating components offered in special housings to accommodate custom installations.

Optional: Waterous' exclusive ELECTRO-MATIC P.T.O. shift (see above), a dependable in-cab control . . . eliminates troublesome mechanical linkages.

Waterous... builders of dependable full power fire apparatus pumps for over 70 years. Experienced in truck mounted rotary and centrifugal pumps for liquid transport and fueling applications and heavy duty rotary pumps.

For complete information on Waterous' split-shaft power take-off write: Dept. 813.

WATEROUS COMPANY

80 East Fillmore Avenue St. Paul 7, Minnesota

Automotive and Aircraft Heat Treating

(*Continued from page* 54)

cal nature of such baths varies according to the temperatures at which they are to be used. Salt bath furnaces, which eliminate atmospheres, may be either *batch* or *continuous*.

Generally used for case hardening small parts, they are electrically heated by submerged electrodes to temperatures in the range of 1500 to 1700 F, or they can be gas-fired where pots or containers are used for the salt; parts may be manually or automatically placed into and removed from the molten salt. Exhaust hoods and anti-splash protection are usually required.

The automotive industry uses a great number of salt bath furnaces of all types in one or another phase of automotive production. Thus, carburizing equipment, neutral hardening equipment, tempering, quenching furnaces, and brazing units have all been employed.

DESIGN TRENDS

Highlight of the 1955 annual meeting of the Industrial Heating Equipment Association was a paper entitled "What the Automotive Industry Expects from the Heating Equipment Manufacturer." Presented by Robert E. Morken, Consultant, Heat Treat Methods and Equipment, Chrysler Corp., it appraised heating equipment installations at the time in the light of the industry's future wants and needs.

Mr. Morken was contacted by the writer and asked to comment on how the challenges and requirements he set forth in his paper are being met and what lies ahead. His remarks, plus some gathered from leading heating equipment manufacturers, are found below.

Mechanization

The trend is distinctly toward integration of heat treating processes into automated production lines. More and more furnace equipment is being installed in-line with machining and stamping operations to provide a straight flow of product.

Mechanization of such furnaces has been carried out to the point of automatic loading and unloading. Modern instrumentation provides for automatic cycling and complex program control, and recent devices enable automatic control of atmospheres. For smaller quantity production and quick changeover to a variety of sizes and shapes of the treated parts, semi-automated lines of a number of mechanized batch type units become more and more popular.

Mechanical movements required in automatic furnaces have been notably improved. Simplification has been difficult because of the increased number and speed of movements requested by automotive manufacturers. Much effort has been expended, however, in designing more rigid, smoother operating, and less troublesome transfer devices. More functions are being performed by mechanical rather than hydraulic means.

Construction

The redesign of charging and discharging mechanisms has decreased vestibule volume to enable more rapid purging and increased structural strength. The new "alligator" type door provides improved sealing against air leaks and is also a safety aid because the door opens when power fails.

A number of furnace manufacturers are providing suitable portholes and/or doors for inspection of loads in process and mechanical operations within the furnaces. More and better safety appliances are being installed.

New Materials

Much effort has been concentrated on the development of stronger, more stable alloys and refractories able to withstand higher temperatures for longer periods of time. Some foundries can now furnish "super" alloys with much greater strength than the alloys normally used at temperatures up to 2100 F. Several furnace builders have designed around the use of refractories for furnace components formerly made of heat-resistant alloys.

Quality Control

Much progress has been made in minimizing distortion, primarily through flexible designs in quenching systems. Positively regulated flow of quench throughout the work load now control both direction and velocity. One manufacturer has completely eliminated die quenching of transmission components.

Close control over the geometry of the work loads by means of proper fixturing has also reduced distortion in several instances. Furthermore, an accelerated effort is being made to control distortion by means of marquenching and austempering. Several large automotive transmission plants are marquenching highly stressed gears to such accuracy that no grinding or lapping operations are necessary after heat treatment.

Future Trends

The swing toward mechanization will certainly continue, while specifications on hardness limits and distortion of heat-treated parts will become more rigid. Further attempts will be made to reduce the amount of work in progress in heat-treating operations. Higher temperature heat treatments to achieve more rapid reactions and increase production or savings in floor space can be expected.

Radical innovations in furnace design for better adaptation to automated lines and installation in air-conditioned plants seem quite likely. Revolutionary advances in the field of heat transfer will improve uniformity of heat treating operations and greatly increase the unit capacities of both batch and continuous furnaces. The development of new atmospheres to obtain entirely new physical or chemical properties in heat-treated materials is in the offing.

CONCLUSION

Technological developments in the industrial heating field have been made for the most part by the equipment manufacturers. Sizable investments, both in engineering manhours and expenditures of money, have been required to bring about these advances, often with no direct compensation to the manu-

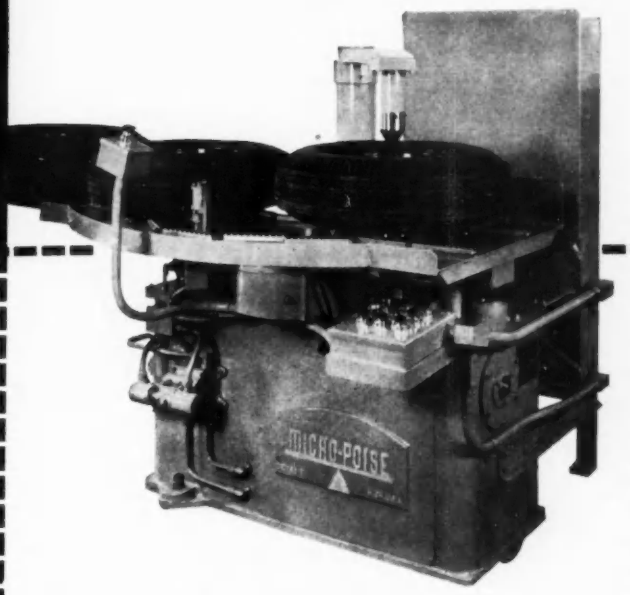
NEW SUSPENSION TECHNIQUES REQUIRE

Production WHEEL BALANCING

The merits of well balanced tire and wheel assemblies have long been recognized in the manufacture of luxury cars.

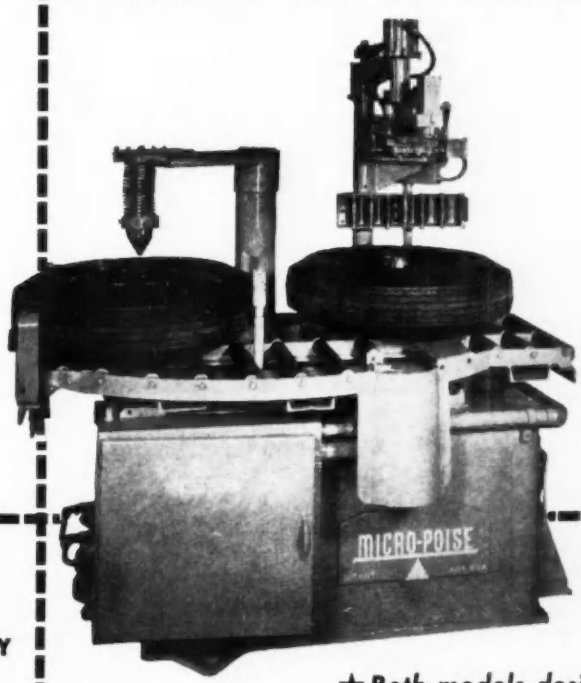
Now new and better suspension methods have pointed up the need for good wheel balance in *all* cars.

Two new Micro-Poise balancing machines, developed especially for the high production needs of the automobile industry, are helping manufacturers economically to extend what was once a luxury car feature to high volume models.



★ *(Above)* **Semi-automatic machine takes pieces from a power conveyor, balances them and locks them in position while an operator reads unbalance information on a universal level. After he applies the correcting weight the finished piece is returned to the conveyor as the next piece comes into position.**

★ *(Right)* **Fully automatic machine takes pieces from power conveyor and delivers them back to conveyor balanced and marked for correction in terms of weight and location.**



★ ***Both models designed for installation in existing automatic mounting and inflating lines.***

MICRO-POISE
ENGINEERING AND SALES COMPANY

14851 Grand River Avenue
Detroit 27, Michigan

Phone: VErmont 8-1134

Circle 128 on Inquiry Card, for more Data

facturer who made the contribution.

The heating equipment manufacturer is a specialist with years of experience behind him and is prepared to offer a top caliber engineering service. A good case can be made for recognizing this specialization through the award of engineering study contracts, instead of letting competitive bids on advanced design equipment. Proper evaluation of the engineering contribution is the only way to encourage engineering advancement in this field.

Acknowledgments

The author wishes to thank all of the manufacturers of industrial furnaces and equipment listed below who contributed data and photographs for this article. Invaluable assistance throughout the project was given by the Industrial Heating Equipment Association (Robert E. Fleming, executive vice-president). A note of appreciation is also due the automotive manufacturers who furnished figures on their furnace installations.

Ajax Electric Co.
Continental Div., Lindberg Industrial Corp.
Eclipse Fuel Engineering Co.
Electric Furnace Co.
Gas Atmospheres, Inc.
General Electric Co., Industrial Heating Dept.
Harper Electric Furnace Corp.
Hevi-Duty Electric Co.
Holcroft & Co.
Holden, A. F., Co.
Leeds & Northrup Co.
Lindberg Engineering Co.
Minneapolis-Honeywell Regulator Co.
Sunbeam Corp.
Surface Combustion Corp. ■

Likelihood that we'll have a national sales tax in the not-distant future is growing stronger. Joel Barlow, a leading Washington attorney, believes a sales tax is "inevitable."

Congress is not disposed to face up to Federal revenue problems brought on by cold war until the situation becomes worse than it is. There is general agreement among leaders in both Senate and House, however, that income taxes—both corporate and individual—are now producing optimum yields and that the Congress will have to mine a new vein.

In order to pay for national defense, the Congress inevitably is going to have to enact some kind of sales tax, Mr. Barlow believes. A rate of about 1½ per cent on all products, except food, clothing, and medicine has been proposed by Vice-President Nixon. Mr. Barlow believes a 1½ per cent rate would be "about right."

AUTOMATION NEWS REPORT

(*Continued from page* 42)

with a master deck of cards. Using the APT system it is now possible for any manufacturer with a general purpose computer to develop thousands of separate machine-control instructions to direct his machine tool.

Key to the entire system is the strange but easy-to-use language developed by Douglas Ross, 29-year-old M. I. T. researcher, whose brainchild APT is.

APT Language

The master robot's Esperanto now has a vocabulary of 107 six-letter words, based on simplified English words. In the language of the machine, RGT means right, LFT means left, KUL means coolant. Following is an example of an instruction in the new master robot's jargon:

"ON KUL, ON SPN, GO RGT, TL LFT, CIRCLE/CTR AT, +2, +3, RADIUS, +5." Translated the sentence says: "Turn on the coolant, turn on the spindle, go right with the tool on the left side long the circle whose center is located at x equals 2, y equals 3, with a radius of 5."

This language would be meaningless to an ordinary electronic computer. However, APT's designers have devised a simple method of teaching the language to a general purpose computer. The means used is a master deck of 10,000 to 18,000 punch cards, developed after two years of intensive research by M.I.T. engineers in cooperation with 19 aircraft plants in the U.S.

How APT Works

When the cards are inserted, the ordinary computer is converted into an APT computer that can master the APT language in a few minutes. Given directions in APT language, the computer goes to work and calculates tool positions needed to make a part and then produces a punched tape which can direct the machine control system.

This is the way APT works:

A designer conceives the part, drawings are made, and a general outline of the machining sequence to be followed is written in APT language. (Any technician can do this job after a short training period.) The directions—in APT language—are punched on cards by a typist and fed into the computer, which then produces the tape.

The APT system has two important advantages say its developers: First, the APT language was designed so that standard procedure can be followed throughout the aircraft and missile industry; second, the system was purposely designed to be flexible, allowing future growth to accommodate still more complex parts.

APT developers point out that the new system can now be used economically only in industries that turn out large complex parts such as in the aircraft field and that it would have little application in mass production operations.

As an example of how APT can cut costs and increase lead time in the aircraft industry, this case was cited: A typical wing rib shape that required 200 man hours to program manually took just five hours by the APT method. In most applications, however, man hour reductions in the range of 80 to 95 per cent can be expected through use of APT system, according to M.I.T. officials.

Containers for Highway-Rail-Ship Use

(*Continued from page* 29)

2) The Mobilvan system, backed by the Clark Equipment Co. It uses 17-ft containers, a fork lift truck for transfer, and an ingenious hold-down in which the container snaps into a groove in the flat car or trailer chassis and is held by steel pins. The Mobilplank unit in the deck of the flat car can be folded under so that the car can be used for all usual flat car purposes as well as for container conveyance. Cars can be side loaded. The lift truck costs about $20,000.

3) The PAT system, sponsored by Pullman and Trailmobile. This system makes use of four steel piers mounted on a standard flat car so that the container, driven aboard the car on its chassis, can be rested on the piers and the chassis driven out from under it. The piers swing back sufficiently to permit the container and chassis to pass during loading, and to permit the use of the flat car for ordinary use when not in container service. The advantage of low clearance is lost, however.

4) General American Transportation system, with Fruehauf and Southern Pacific Railroad cooperating, makes use of a special 791-ft railway car, with roll-off and roll-on of the container without the necessity for a lift. A cable carried over a snatch-block at the end of the car, or string of cars, and to a winch on a power take-off on the motor tractor, powers the transfer. The same cars are especially designed for carrying trailers in piggy-back operations. Four 17-ft containers can be mounted on the car.

5) Railiner system, proposed by Southern Car and Manufacturing Co., in which a special transfer chassis with extensible arms on each side serves as a bridge between the container chassis and the flat car. This system permits side loading. Powered rollers in the arms of the transfer chassis move the container onto or off of the flat car.

In addition to all of these, there are variations to fit the systems into special conditions. The steamship companies, and some of the railroads at larger terminals, use a powerful crane to lift the containers onto or off of the railway cars. Straddle cranes have been proposed for this use also, and one company has produced a straddle crane on rubber tires for use in railway yards. While most eastern trucking companies want to use a 17-ft modulus for container length to meet limitations in some eastern states, western operators, with more generous highway specifications, would like to use a 24-ft modulus. Matson Steamship Co., for example, carrying produce from the Hawaiian Islands, wishes to use 24-ft containers, and possibly up to about 40-ft boxes, in the holds of its ships, and sees little point in arguments that these containers don't fit European flat cars. Lykes Steamship Co. uses an 8-ft cube as its starting point, increasing the length as is required. Rock Island Railroad reports that it has found so little use for its 35-ft containers that it is using many of them for portable tool sheds. The 17-ft containers are in demand. Many containers are now made with pockets for a fork lift truck, and with rings at each corner for attaching hooks of a crane, so as to be adaptable to such transfer. Finally, U. S. Rubber Co. has announced its development of large collapsible rubber bags for transporting liquids on flat bed trucks or trailers, the bag to be collapsed and folded away for the return trip.

For the producer of goods, containers can be valuable and versatile tools. Containers mounting their own refrigerator units are available for shipping food products. Containers in special sizes are available for greatest efficiency in loading. Containers can be used for outdoor storage of goods if a delay occurs in arranging for a shipment. Above all, containers provide a means for moving goods over several transportation sys-

tems with the cost of transfer cut from dollars to cents per ton.

Many companies are holding off on containerized shipping even while recognizing its great cost-cutting potentialities because of the lack of a standard system. A committee from American Standards Association is now studying the problem, but does not expect to make a recommendation for several years. American Trucking Associations are studying the matter also, as are various departments of the military. There are rumblings from various unions that foresee infringements upon their pay envelopes. When a standard system is decided upon, and accepted by the transportation industries, however, it will be possible to move goods with a minimum of handling from the manufacturer or other supplier over highway, over rail, over water, and probably even through the air to its destination—in containers. ■

Painting Techniques at Mercury Assembly Plant

(*Continued from page* 32)

units are capable of delivering up to 10 gpm. They are usually set to deliver four gpm, but are designed to increase their speed automatically as the need for paint increases.

Two mixing tanks are attached to each color line in the paint house. Paint in these tanks is constantly mixed by individual air-operated agitators. This tandem operation permits workers to fill reserve tanks as needed while the recirculating tanks continue in full operation. Thus, down-time for refilling is avoided and the paint supply is continuous.

After a shell has been through the wet sanding treatment, it moves to the first enamel booth. Another team of eight spray painters applies the enamel, working as in the first booth, from opposite sides of the body. Each of the eight spray stations is equipped with an outlet for each of the 16 colors used. All a painter has to do is check the color tag, pick up the right fluid hose and snap it to the gun, and the paint is there.

Binks oil and water extractors, located at each spray station, remove foreign elements from the air lines and provide proper atomizing pressure at the guns. Each color is controlled by a fluid regulator, which tells the spray painter whether he is receiving the necessary pressure for maximum efficiency and results.

After the first enamel coat is applied, the shell moves on to another oven for another 27 minutes of curing at 270 F. Then it moves on to the third and last booth where it receives the tu-tone of flo-tone application.

Following a final curing, the bodies go to the trim lines to have windshields, weatherstripping, hardware, interior fabrics, windows, instrument panels, hand brake and other items installed. ■

"WEIRKOTE® WON'T PEEL OR FLAKE—AND CAN END THE NEED FOR FURTHER CORROSION PROTECTION AFTER FABRICATION."

Q. A zinc-coated steel sheet that won't peel or flake, even under the severest fabricating stresses?

A. Precisely. Weirkote's made by a continuous process. The zinc is so integrated with the steel that even the toughest "torture" tests of fabrication leave that bonded coating intact. You can work Weirkote to the very limits of the steel itself!

Q. Our products are pretty intricate—take lots of flexing, crimping and so on. What about those hard-to-reach places?

A. Weirkote's zinc coating is so uniform—protects even the most complicated parts.

Q. So with Weirkote you bypass the need for further corrosion protection?

A. You get the picture! Think of the time, labor, space—the costly capital outlay—you save. Better steel products at far lower costs—that's Weirkote for you!

Send for free booklet that details the time-and-cost-saving advantages of skin-tight zinc-coated Weirkote. Just write Weirton Steel Company, Dept. T-2, Weirton, West Virginia.

Circle 131 on Inquiry Card, for more Data

WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY

WEIRTON, WEST VIRGINIA

a division of

NATIONAL STEEL CORPORATION

Volume Production of Electric Windshield Wipers

(*Continued from page* 36)

chining many of the components. A good case is the heater motor shaft produced on a line consisting of two Cincinnati Centerless grinders, a Denison press, and a Waterbury-Farrel roll knurling machine. Shaft blanks are produced in the National Acme-Gridley automatic department, go through the centerless grinders for OD grinding. The Denison press is rigged up as a surface broaching machine, producing a flat. Final operation (Fig. 8) is that of rolling the knurl at the end in the Waterbury-Farrel machine. The entire cycle is completed at the rate of 30 pieces per minute.

Motor case halves are produced in transfer machines, starting with a circular blank. Illustrated here (Fig. 9), is a Verson seven-station Transmat used for this purpose. There is also a V & O six-station transfer press for the same operation. Piercing of the part is handled separately in the special Version dial type press which may be seen in the background at the left.

Windshield wiper assembly has been organized on a system of conveyors in which the first section assembles the drive mechanism. Parallel to this conveyor is another conveyor for building up the wiper mechanism.

Windshield wiper units are transferred from the assembly conveyor to the run-in conveyor which eventually transports the assemblies through the test stands. The run-in conveyor, as its name implies, provides electrical connections for running in each unit while moving to the final test stands.

It may be noted at this point that windshield wiper assemblies are tested 100 per cent before being shipped. This involves not only individual inspections of components before assembly but a complete schedule of testing for the finished assembly.

Even the few examples described above must indicate that the manufacture of windshield wiper units and other electrical equipment produced by the company is a rather complex affair running the gamut of techniques known to the art. In addition to electrical components there are numerous press operations, machining of aluminum die castings, machining of shafts and other steel parts.

The windshield wiper alone has some 156 parts, on the average, some procured from vendors. The manufacturing department is constantly on the alert for new methods, new equipment, and a fresh approach to the production of individual parts. In an operation of this character it is obvious that both engineering and manufacturing must work closely together to achieve the goals of simplification, improved quality, and lower costs. ■

BOOKS . . .

ADVANCED DYNAMICS, *by John E. Younger, published by The Ronald Press Co., 15 East 26th Street, New York 10, N. Y. Price, $8.50.* This analysis of dynamics attempts to supply fundamental principles and theorems to modern problems. The author's examples have been worked out in detail, using more than one method of approach. The physical significance of each mathematical step is explained. Among the subjects covered are: D'Alembert's principle and Lagrange's equation in motion, moving axes, relative motion, the free-body diagram and ellipsoid of inertia. This book is intended for students of advanced dynamics as well as the design engineer who must have principles and theorems reduced to the level of practical working tools.

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Timken-Detroit Heavy-Duty Tandems Are First Choice With Big Off-Highway Operators!

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"Cradle Ride" Suspension. Free ends of long, resilient springs float in axle spring guide brackets. This permits axles to articulate freely, compensating for road irregularities. Floating springs cradle the vehicle, materially reducing road shock and eliminating source of vehicle flutter. *The load is more stable . . . driving is easier, more restful, safer.*

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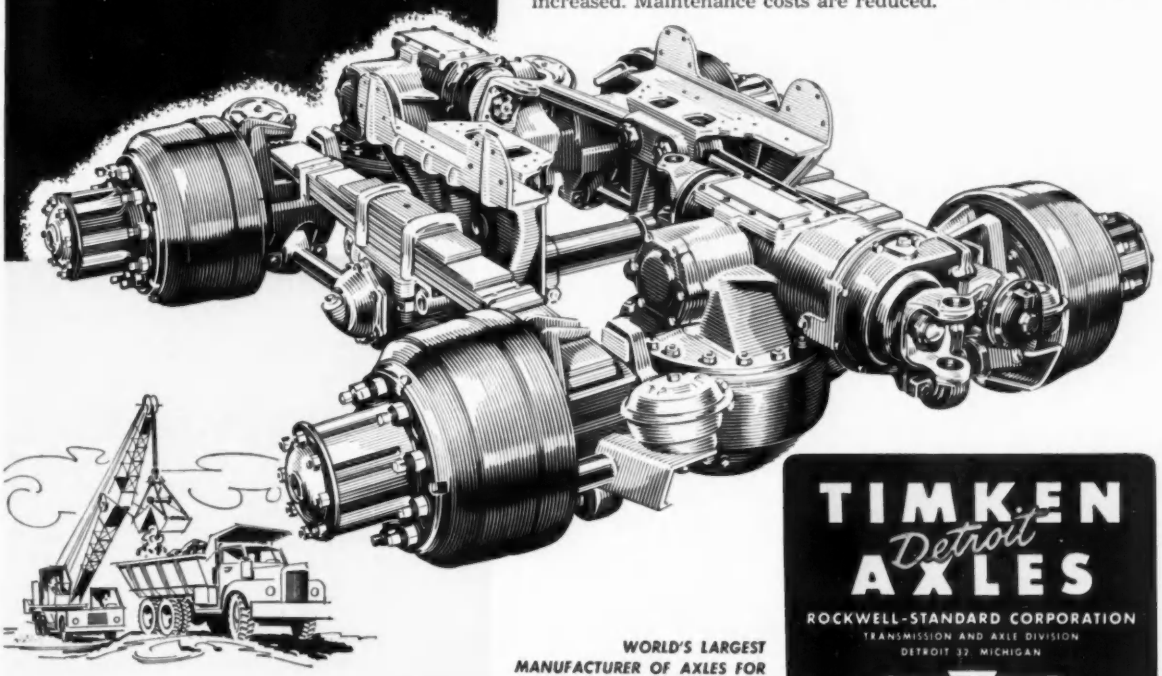
Straight-Line Through Drive. Straight through drive eliminates all prop shaft angularity. Bearing and gear life is materially increased. Maintenance costs are reduced.



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Versatile Machines at Koehring Plant

(*Continued from page 41*)

table. There are eight of these, providing for the drum shafts, horizontal swing and traction shafts, and countershafts for the gear train. The set of fixtures consists of a base plate for each size turntable, interchangeable with one another on the machine table, and an inside fixture for each size, the inside fixture fitting into the weldment after it is positioned on the base plate. The inside fixture is positioned on pads on the base plate, so that it presents no difficulty in setup. It bears the inside bushings that, with the bushings in the external fixture, locate the boring bar for each hole. The eight holes are held to tolerances of plus or minus 0.001 in. between centers. Several of the holes are faced and counterfaced.

The final machining operation consists of drilling holes for the shifting yokes in the gear case, and for the boom foot holes. This is done on a Carleton 7-ft radial drill, with the turntable in an upright position.

Machining of the car body, on which the turntable rides, is done in the same way. This piece is a heavy weldment, with an alloy steel casting for the ring gear that comprises the top of the car body. The ring gear is welded onto the formed steel plate base with about 400 F preheat to prevent cracking. The cast teeth in the ring gear are cleaned up with a hand grinder to fit a gage pinion.

The car body is put on a 120-in. Cincinnati vertical boring mill, and the top flange of the ring gear is turned, bevel faced, and bored. The piece is then turned onto its side in a fixture on a Giddings & Lewis horizontal boring mill, and all milling and drilling is done in one setup. A final operation is the milling out of the block for the bearing for the crawler drive, done in a locating angle fixture in which the piece is mounted in a horizontal position. The piece then goes to assembly. ■

Higher Government Spending

Total Government spending in the months ahead is certain to climb higher, despite Ike's efforts to hold the line at $77 billion-plus. New spending programs written by the Congress plus inflated prices of defense items are responsible. When the political debate on spending ends, the budget for the new fiscal year will be about 5 per cent ahead of what Ike asks.

Optical Gaging for Surface Inspection

(*Continued from page 37*)

reticle on the screen as it moves.

A third component, which gives a gaging guide, is a circular set line which appears on a translucent chart fixed over the projector's viewing screen. In size it corresponds to a 31.25 x blowup of the probe's ball point. As long as some point of this circle remains within the maximum - minimum reticle-gage image projected on the screen, it indicates that required tolerances are being maintained.

To check a housing, the inspector moves the probe along four segments of its interior, observing whether the chart circle stays within the tolerance lines. At the beginning of each segment, he resets the reticle-gage by moving it slightly so that the reticle image and chart circle adjoin. This indexing prevents the buildup of cumulative error in tolerances of each segment.

Within two minutes at the Kodak Contour Projector, the inspector is able to check the first land, from back facing of the housing to the first undercut, within ±0.01 in.; the first undercut within ±0.0025 in.; the second land within ±0.003 in.; and the second undercut, also within ±0.0025 in. He also checks the depth of the finished undercuts within ±0.003 in. ■

METALS

(*Continued from page* 62)

32½-33 cents for refined metal when processed 90 days hence.

Metal Stocks At Low Levels

The February statistics of the Copper Institute showed U. S. refined stock to be still dangerously low, equal to no more than 3 months supplies with the producers. On a world basis they totalled about 40 days supply at the February rate of deliveries. Daily deliveries in U. S. during the month averaged 4290 tons which compares with 3231 tons per day in 1958 and 4000 tons per day in the banner year 1956. Mine production kept pace, averaging 3234 tons per day, compared with 2762 tons in 1958 and 3096 tons in 1956. But it now appears that U. S. mine output has about reached its peak and cannot be appreciably expanded. The same cannot be said for mine production abroad barring strikes in Chile and Rhodesia which cannot be entirely ruled out. It must also be noted that foreign copper consumption has recently tended to level off to average 1957-58 usage in contrast with the trend in this country.

Little Inventory Building Yet Evident

Demand is generally good for aluminum but unlike the situation in steel or copper, there appears to be little stocking up for a possible strike in August when labor contracts expire. The lack of heavy buying is ascribed to consumers belief that production could be readily increased on short notice because of the industry's admitted over-capacity, plus an adequate supply of metal held as stock by the producers. The assurance that the price of ingot and pig will be held unchanged at least through June 30 is of course an added reason for consumers to avoid laying in large supplies against a price rise.

But a steel strike would almost certainly cause a change in attitude by aluminum consumers as it would certainly indicate a strong possibility of the same thing for the aluminum producers and in all likelihood a higher price for the metal to compensate for any wage increase.

Aluminum Producers Operate Below Capacity

The situation is mixed for aluminum. Alcoa reopened one of its potlines in Texas because of rising demand for the metal. In February it had previously reactivated a pot line in Tennessee for the same reason. On the other hand Kaiser cut out a pot line at its Meade, Washington plant, reducing output there to 64 per cent of capacity.

February output of primary metal by the six producers was about 142,000 tons, down from the all-time record of 156,000 tons in January. The present rate of output is about 80 per cent of capacity.

Zinc Price Cut

Much to the surprise of most of the trade the zinc price was cut ½ cent a pound early in March to 11 cents. It had held steadily at a 11½ cents since last November. Sales had been nothing to brag about in recent weeks with a special disappointment evinced over the slack demand for Special High Grade brand from the diecasters. Galvanizers were doing more than their share in calling for large tonnages of zinc but they could not carry the whole production load. Shortly after the cut in the slab zinc price leading manufacturers of zinc diecastings announced a similar reduction in selling price. The auto industry which has been the principal consumer of diecastings has signally failed to take the normal tonnage and demand for the Special High Grade has suffered accordingly.

The latest figures from the Zinc Institute explain the rather dis-

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Feed Out Stock to 16½"
Eliminate Pushers and Feed-Out Cams

Greenlee Air-Feed Automatics offer you a 3-way profit advantage:

1. Maintenance and change-over time is reduced by eliminating stock pushers, feed tubes and feed-out cams.
2. Stock can be automatically air-fed to position in one or more machining stations permitting two or more pieces per cycle.
3. Multiple feed-out flexibility enables you to finish machine a variety of pieces that ordinarily demand costly second operation setups.

If you are running into production headaches on a specific job, Greenlee may be able to adapt an "Air-Feed" to solve your problem. See your Greenlee Distributor.

Write for your copy of Catalog A-405 — first step on the way to more profitable production with Greenlee Automatic Bar Machines.

Removable fittings attach air lines to the stock reel tubes. A vacuum pump withdraws the piston when restocking. Push-button control panel is provided for starting and stopping.

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Multiple-Spindle Drilling and Tapping Machines

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appointing statistical position. Output of slab declined about 5300 tons in February but increased about 75 tons on a daily basis. This would indicate about 80,000 tons production for March. Shipments in February totalled 65,600 tons down about 5100 tons from January and slab zinc stocks increased 4700 tons to total over 200,000 tons. This is some 11,000 tons more than a year ago but represents a decline of 57,000 tons from the peak last July.

The trade derived some satisfaction from the steady price in London approximately about 9½ cents a pound. This is about at parity with U. S. prices after allowing for 0.7 cents tariff and about 0.75 cents freight. In consequence there is less likelihood of heavy exports to this country as long as these conditions exist.

Lead Price Weakens, Rises

After a third consecutive price cut which brought lead down to 11 cents a pound the market suddenly strengthened and sales picked up sharply bringing weekly volume to the highest total in several years. Producers raised the price to 11½ cents and following the increase consumers placed orders for fair tonnages. The London market has been steady, about 9 cents equivalent to about 10½ cents here after duty and freight. Sales of scrap lead to the secondary smelters have been light and this has tightened the supply.

The statistical position of lead still leaves a good deal to be desired. Total stocks of lead in the hands of smelters and refiners as of Feb. 1st amounted to 332,000 tons, an increase of 21,700 tons over January and a gain of 111,300 tons over the total on hand a year ago. It does not appear that the quota system instituted last year has been of any special benefit to either lead or zinc as yet. But the main trouble has been an erosion by some of lead's principal markets thru substitution of other metals. ■

SHORTIES

Turbine-powered aircraft now on order by the world's airlines will provide as much new passenger transport capacity as 160 ships of the Queen Mary class.

•

It is estimated that scheduled airlines will carry 95 million passengers this year, an increase of about 6 million passengers over 1958.

•

One aircraft components manufacturer is now using an "electric blanket" to speed the bonding of 60 to 70 delicate parts, which make up each panel of a jet transport. Tiny thermistors act as the "brain" to direct power to the electric blankets.

•

Active aircraft registered with the Civil Aeronautics Administration at the beginning of 1958 totaled 67,153, an increase of 2465 aircraft over the previous year.

•

Steel and iron products account for 37 per cent of all manufacturing jobs in the U. S. For each production worker at blast furnaces and steel mills, more than nine others work in plants which use iron and steel products.

•

About half of all petrochemical raw materials are by-products of refineries; the rest come from natural gas or LPG derived from natural gas.

•

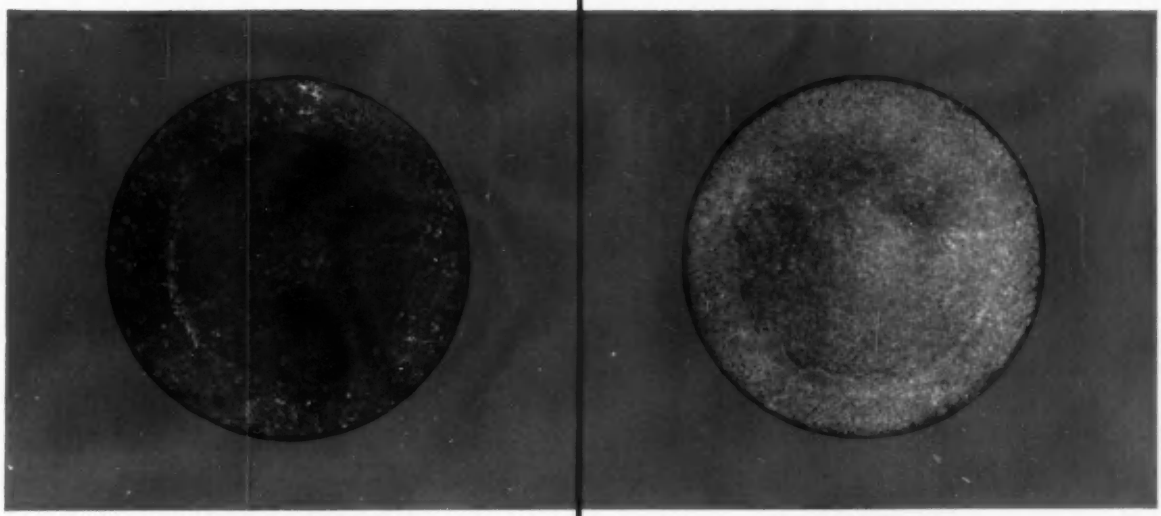
Taxes on a single oil product—gasoline—last year brought more money into state and Federal coffers than the total revenue collected by the Federal Government from all tax sources in the first 88 years of the nation's history.

•

Oil industry economists predict that by 1965 more than 11 million barrels of crude oil will be processed every day by the nation's refineries—double the 1950 rate.

The EATON Process of Aluminizing Exhaust Valve Heads PREVENTS PRE-IGNITION

CAUSED BY INCANDESCENT SCALE



NOT ALUMINIZED
Note Scale which Promotes Pre-ignition

ALUMINIZED
Absence of Harmful Scale Prevents Pre-ignition

Conventional exhaust valve steels, run at high temperatures, tend to corrode and scale, promoting damaging pre-ignition. This condition can be overcome by the use of expensive high-alloy materials. However, there is a simple and less expensive solution to the problem. By applying the Eaton aluminizing process to conventional exhaust valve steel, resistance to corrosion and scaling can be increased tremendously, thereby eliminating a condition which can be a major cause of pre-ignition.

Inlet valves conditioned by the Eaton aluminizing process also are contributing to the increased efficiency, dependability and service life of engines.

Our Valve Division engineers will be glad to discuss the application of Eaton aluminized valves to your engines. Send for illustrated literature.

Aluminizing of Inlet Valve Seat-Face Prevents Oxidation

After aluminizing by the Eaton process, this plain carbon steel valve was placed in an air atmosphere furnace at 2000°F. for 16 hours. Gross oxidation of the base steel resulted. The aluminized seat-face and margin areas were unaffected.

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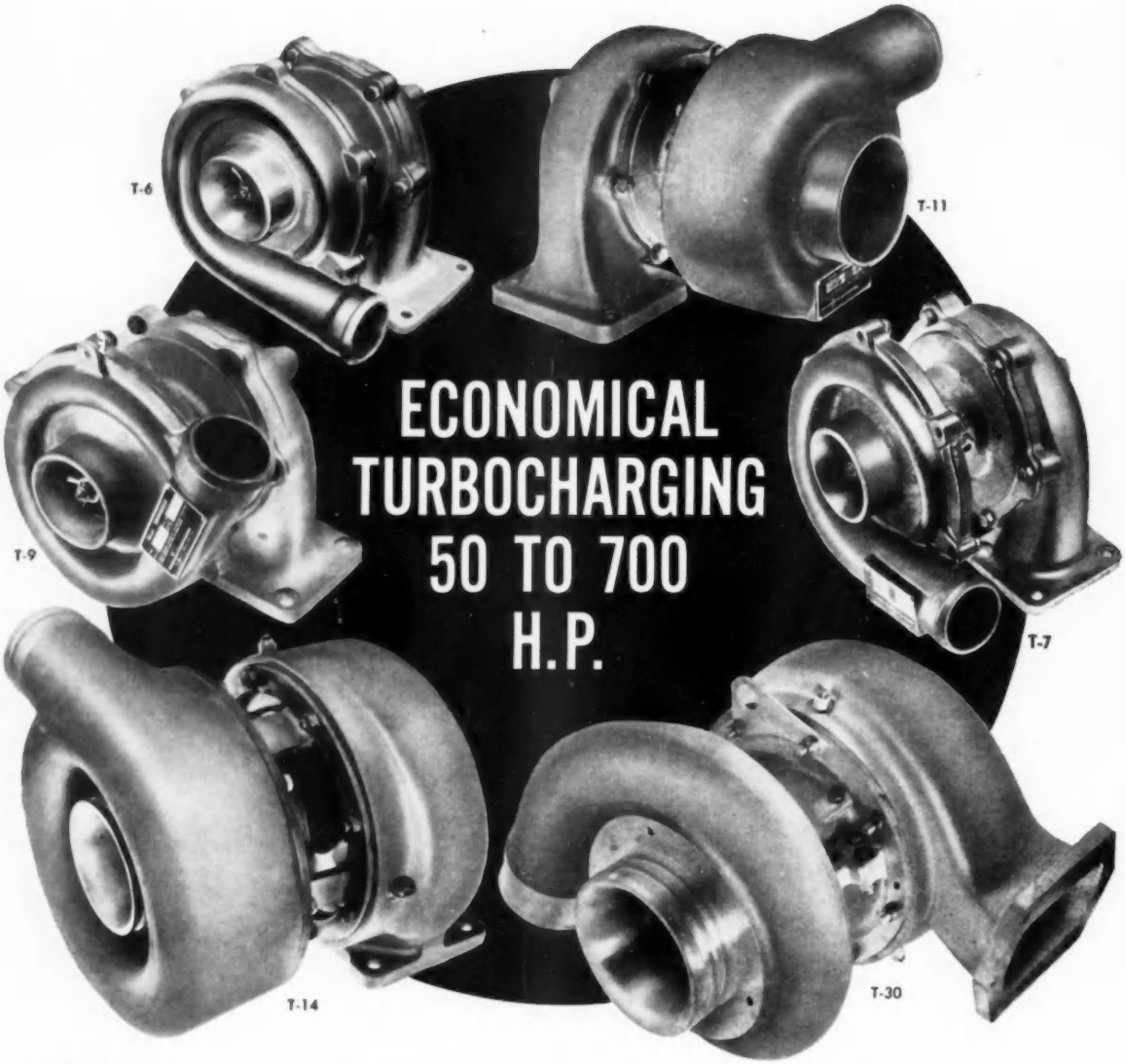

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The reduced cost, light weight and high output of this turbocharger family enables the diesel industry to gain more horsepower per unit cost than has been possible before. They are especially effective in the low horsepower ranges where they make turbocharging of the smaller diesels economically practical for the first time. In addition, use of the AiResearch turbocharger control systems and intercoolers provides the most effective turbocharging available by accurately controlling turbocharger speed over its complete range regardless of changing load characteristics.

AiResearch has sold more than 20,000 turbochargers, accounting for more than six million horsepower now in operation, and is the largest and most experienced manufacturer of lightweight turbomachinery of all types.

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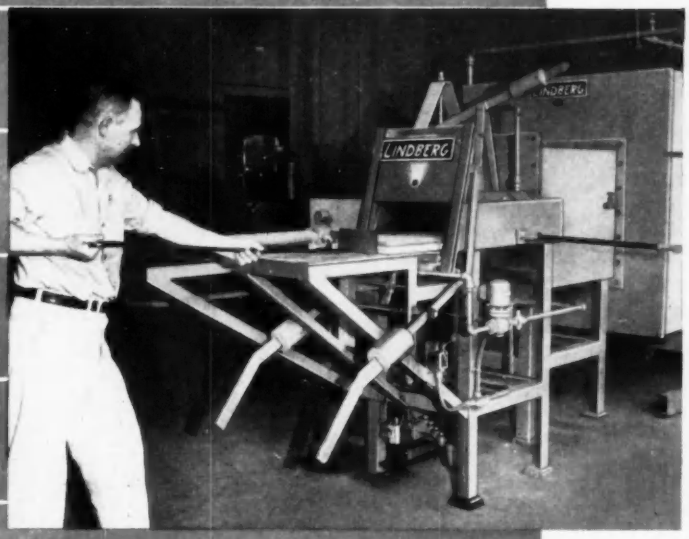
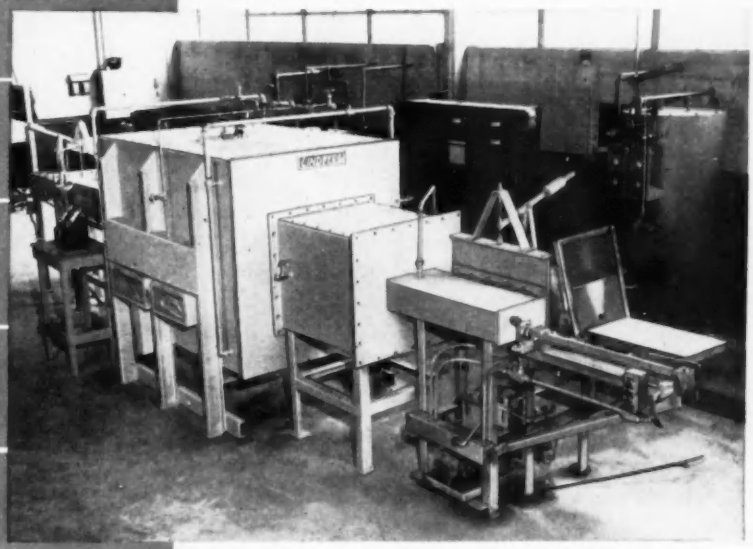


A new Lindberg development, this Molybdenum Element Atmosphere Pusher Furnace is designed with high temperature refractories suitable for low dew point without need for a muffle. It is now being used for sintering stainless steel compacts in hydrogen or dissociated ammonia. Ammonia dissociator and control panels are shown at the right of the furnace below. In this installation hydrogen supply cylinders are located outside the building. Furnace provides side loading and discharge ports with purging chambers. Work trays, ceramic slabs or molybdenum boats, move through the furnace by hydraulic pusher. If you have a sintering or brazing problem why not talk it over with Lindberg. Just get in touch with your nearest Lindberg Field Representative or write us direct. Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, Illinois.

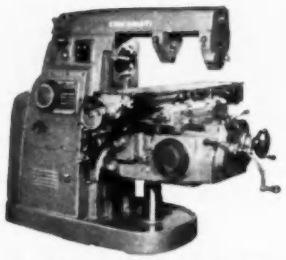


Type MOP-12307-A60C Molybdenum Element Atmosphere Pusher Furnace. Maximum Temperature 3000°F. 60 KW input. 12" wide, 30" long, 7" high. 60" cooling chamber, 36" long preheat chamber.

LOOK UP LINDBERG, BOOTH 2, AT METAL POWDER SHOW IN PHILADELPHIA

LINDBERG heat for industry

Dial Type convenience and ease of control is a big factor in producing multiple operation work at low cost.



CINCINNATI Plain Dial Type Milling Machine. Also Universal and Vertical styles. Built in Nos. 2, 3 and 4 sizes, 10, 15 and 20 hp. Catalog No. M-2003.

ARBOR-LOC is a big timesaver in interchanging the seven cutting tools on the table of the CINCINNATI Dial Type Milling Machine shown at the left.

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. . . for Dial Type Operators

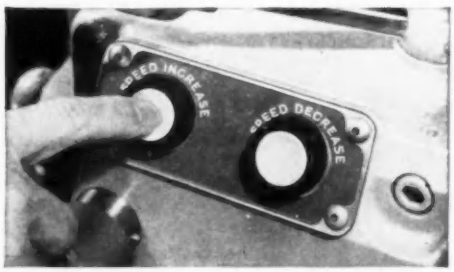
Ask the man who runs one. He'll tell you that CINCINNATI Dial Types are easy and convenient to operate and set up, and they help him maintain high quality . . . important considerations in low cost of production. Three operator-approved features of convenience are illustrated here.

Others include:

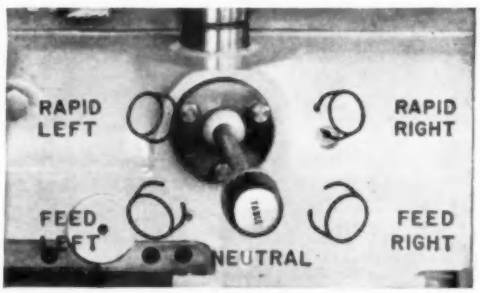
Automatic backlash eliminator for milling to the right or left . . . Power selection of 32 feeds . . . Independent directional control levers, with palm-fitting plastic knobs . . . Identification discs on all control lever knobs . . . Dynapoise chatter-damping overarm, automatically damps out chatter and improves finish on the work . . . Complete rear controls (plain and universal styles)

More information in our new comprehensive catalog No. M-2003. And if you must justify replacement, ask for a copy of our manual No. M-1838.

MILLING MACHINE DIVISION
The Cincinnati Milling Machine Co.
Cincinnati 9, Ohio



Push-button selection of 24 spindle speeds, throughout 16 to 1600 rpm range (18 to 1800 rpm for No. 2 Dial Types).



Five-position lever gives the operator complete one-hand control of the table (automatic cycle machines).

CINCINNATI®

KNEE TYPE MILLING MACHINES • BED TYPE MILLING MACHINES
DIE SINKING MACHINES • CUTTER AND TOOL GRINDERS

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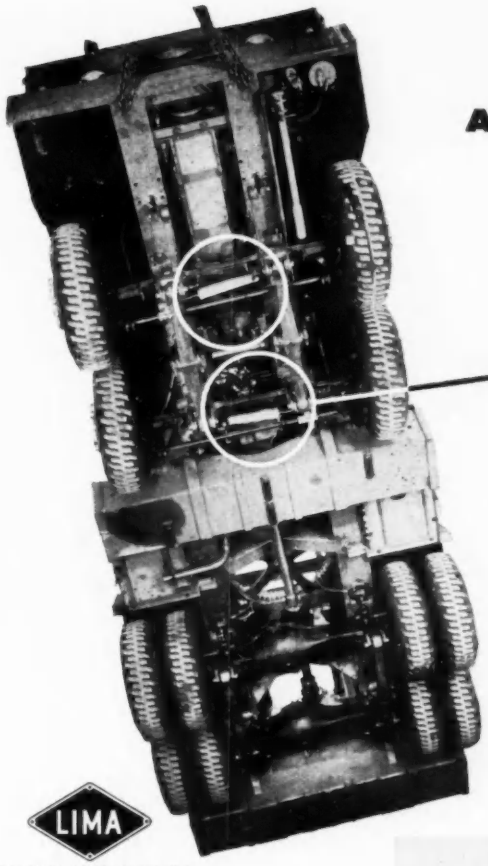

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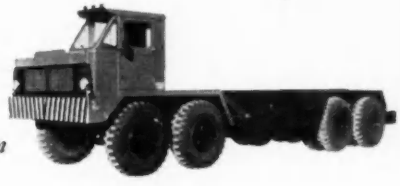
Crane Carrier Corporation



GARRISON Manufacturing Co. Inc.

4609 East Sheila Street
Los Angeles 22, California

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MORE WHEELS LIKE THESE MAKE YOUR BUSINESS GO ROUND

A little to the left — lower it — lock it on — and another motor scraper is just about ready to roll.

But it's barely the beginning. "Staggering" is the only word for the federal highway program, and staggering is the quantity of construction vehicles and equipment needed to complete it. *And this means more business for you!*

Total expenditures, federal and state, are expected to top 100 billion before it's done. Over $20 billion will go for roadbuilding equipment alone!

Already the tremendous demand for new powered construction and materials-handling equipment is being felt. Manufacturers are planning and tooling for it NOW: evaluating new products and components to build into their equipment, studying new processes and methods to build it faster, better, more economically.

This mounting demand is creating tremendous sales potential for you! That's why the time to sell is NOW — and the place to keep selling is AI. Because powered construction equipment represents only one "cylinder" of the $32 billion, 8-cylinder AI market that includes Passenger Cars; Aircraft and Missiles; Trucks, Buses and Trailers; Tractors and Powered Farm Equipment; Military Vehicles; Engines, Parts and Accessories. *Only AI gives you all 8 cylinders!*

Have you read "The New America That's Coming" by the editors of Automotive Industries? A limited quantity available — please write on your letterhead — no obligation.

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Contact your nearest rep and learn why!

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Motor scraper assembly line at courtesy of ALLIS-CHALMERS MANUFACTURING COMPANY...one of the 6,202 plants comprising the $32-billion automotive and aviation manufacturing market reached by AUTOMOTIVE INDUSTRIES.

FREE LITERATURE

Production Unit 1

The Milwaukee-Matic, an extremely versatile production tool capable of automatic milling, drilling, reaming, tapping and boring operations in any sequence, on several sides of a workpiece with a single set-up, is described in a new brochure—"How To Evaluate the Kearney & Trecker Milwaukee-Matic." *Kearney & Trecker Corp.*

Tumbling Machines 2

A series of eight refrigerated tumbling machines specifically designed for de-flashing and fine finishing of moulded rubber parts is described in Form A-26-S. Using liquid CO_2 as the refrigerant, the units enable precision barrel-finishing of rubber parts of most any size or shape. *Almco, Queen Products Div. of King-Seely Corp.*

Switch Devices 3

Catalog 67, 20 pages, covers a line of lighted indicator and pushbutton switch devices. This system of devices offers versatility in combined indication and control. Parts simply snap together to form combination switch-indicator devices. *Micro Switch, a Div. of Minneapolis-Honeywell Regulator Co.*

Titanium Reference 4

A comprehensive brochure on titanium has been prepared by Harvey Aluminum. The 36 page book is intended as a reference for engineers, metallurgists and designers who want the latest information available on titanium. The text covers strength, weight, high temperature performance, corrosion resistance and other properties of the metal.

Pig Iron 5

A 28 page book has been published by Republic Steel Corp. which gives a brief history of pig iron production and details Republic's complete pig iron production facilities.

Servovalves 6

Catalog 150 gives operating principles, design features and performance characteristics of a line of pressure control servovalves. *Moog Valve Co., Inc.*

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FREE LITERATURE—*Continued*

Tracer Control 7

Bulletin GEA-6122, eight pages, describes General Electric tracer control systems for a wide variety of metalworking applications. Vertical boring mills, skin milling machines, center-drive lathes, turret lathes, and contour profile milling machines are among applications discussed. *General Electric Co.*

Saddle Control 8

A saddle control for the Taft-Pierce No. 1 precision grinder is the subject of Bulletin MT-003. The bulletin discusses important saddle control changes which have been made to increase the versatility and tenth-splitting performance of the Taft-Pierce No. 1 grinder. *Taft-Pierce Mfg. Co.*

Press Welders 9

Brochure P59 covers a line of press type spot and projection welders. Complete descriptions and specifications, covering the four available sizes, ranging in capacity from 30 to 500 kva are included. *The Federal Machine & Welder Co.*

Transmission 10

A four page booklet is available describing the design and performance of the dual-range, fully power-shifted Hystamatic transmission which can be obtained as optional equipment for the Hyster pneumatic tire Challenger lift truck series in the 6000 to 8000 capacity range. *Hyster Co.*

Cylinder Information 11

A 16 page condensus that includes their standard and special hydraulic and pneumatic cylinders and other related products has been released by Petch Mfg. Co. It also describes a new concept in hydraulic valve panel fabrication by building block components.

Tensile Tester 12

Complete specifications and operating characteristics of the Hunter terminal pull tester are given in Bulletin 750e. The tester is designed to provide accurate, reliable and fast sample-testing of mechanical strength of solderless electrical terminals. *Hunter Spring Co.*

Welding Nuts 13

"Save With Midland Welding Nuts" tells where and how to use welding nuts to best advantage and demonstrates the many ways in which welding nuts save time and labor in both fabricating and assembly. *Midland-Ross Corp., Owosso Div.*

Boring Bars 14

Bulletin MB-1158, eight pages, describes more than 114 standard boring bars available from Wesson Co. The booklet gives all specifications for two lines of micro-adjustable and two lines of nonadjustable boring bars.

Track Wheels, Rollers 15

Catalog 34 contains a stock list complete with specifications and data on a line of track wheels and rollers for use on materials-handling equipment, industrial cars, trippers, conveyors, or a wide variety of track or rail supported machinery. *The C. O. Bartlett & Snow Co.*

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FREE LITERATURE— *continued*

Chemical Milling 16

Design Bulletin 8 describes recent advances in chemically milled steel alloys. It gives information on the effects of heat treating, surface finishes and tolerances, effect on physical properties, and an up-to-date list of the many steel alloys and other super hard metals that can now be chemically milled. *United States Chemical Milling Corp.*

Universal Joints 17

Curtis Universal Joint Co., Inc. has prepared a comprehensive catalog covering their entire line of single and double universal joints. The catalog contains information on disassembly, reassembly and lubrication, key seats, setscrews and broaches available, and related information.

Throwaway Inserts 18

A line of carbide throwaway inserts and toolholders for high speed, precision turning and boring is described in 19 page Circular 625. *Pratt & Whitney Co.*

Coated Abrasives 19

Magnecoated abrasive disks are the subject of a four page illustrated brochure. "Giant Brand" disks are used for standard, general industrial, sheet metal, soft or semi-soft metals, ceramics, glass and wood. A price list is included along with size and grit information. *Abrasive Co. of America.*

Bearing Bushings 20

Jergens live roller bearing bushings are described in a six page catalog. The catalog covers the advantages and applications of live roller bearing bushings in jigs and fixtures, special machines and automation equipment, and the use of live bushings in horizontal milling machine outboard support applications. *Donley Products, Inc.*

(Please turn page)

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Compressor Data 21

Bulletin A-44, 12 pages, offers information on WGO-9 oil-free compressors. Data on 14 sizes of the heavy duty industrial units which range from 95.6 to 939 cfm are included. *Joy Mfg. Co.*

Grinding, Buffing 22

Catalog 59 contains descriptive information, illustrations and specifications on a line of pedestal, snagging, disk, lathe, and carbide tool grinders, buffing and polishing lathes and related equipment. *The Cincinnati Electrical Tool Co.*

Precision Machines 23

Three machines, the No. 3 Moore precision jig borer, No. 3 precision jig grinder, and the Moore universal measuring machine, are covered in a two-color brochure. All three machines are designed to split-tenth accuracy. *Moore Special Tool Co.*

Bench Press 24

The Model 10-T Pneumark impact bench press, equipped with shuttle feed and stackers making it a highly efficient production nameplate marker, is described in a circular from *Geo. T. Schmidt, Inc.*

Clutches, Converters 25

A line of single plate automotive clutches and automotive torque converters is described and illustrated in a detailed engineer's manual prepared by *Borg & Beck Div. of Borg-Warner Corp.*

Rolling Head 26

Bulletin F-99-1 contains detailed information on a line of thread rolling heads including dimensions and specifications. *Landis Machine Co.*

Press Catalog 27

Catalog 350A, 16 pages, features the complete Dake press line including electric, air and hand operated hydraulic presses, arbor presses, utility presses, and custom engineered presses for specialized applications. *Dake Corp.*

Another new development using

B.F.Goodrich Chemical *raw materials*

Strick Trailers, Philadelphia, Pa., employs "Plymaster V-2" adhesive produced by Rubber & Asbestos Corporation, Bloomfield, New Jersey, to bond plastic skylites to aluminum roof sheets. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber only.

In new dry adhesive in film form

Hycar rubber speeds and simplifies bonding

Mass-production bonding of flat surfaces as unlike as plastic and aluminum demonstrates the efficiency of this new dry adhesive in film form. It uses Hycar nitrile rubber to produce a bond between plastic skylites and aluminum roof sheets on both trailers and truck bodies. The adhesive manufacturer says Hycar provides a higher combination of cohesion and adhesion strengths than any other copolymer tested.

The adhesive comes in rolls from which sheets can be cut to exact size. No need for expensive liquid-handling equipment. You get a much cleaner, faster operation. The film adhesive can be reactivated with common solvents, heat or pressure to achieve tensile strengths as high as 1500 psi.

The exceptional qualities of Hycar nitrile rubber have led to produce improvements in many fields. For more information, write Dept. CK-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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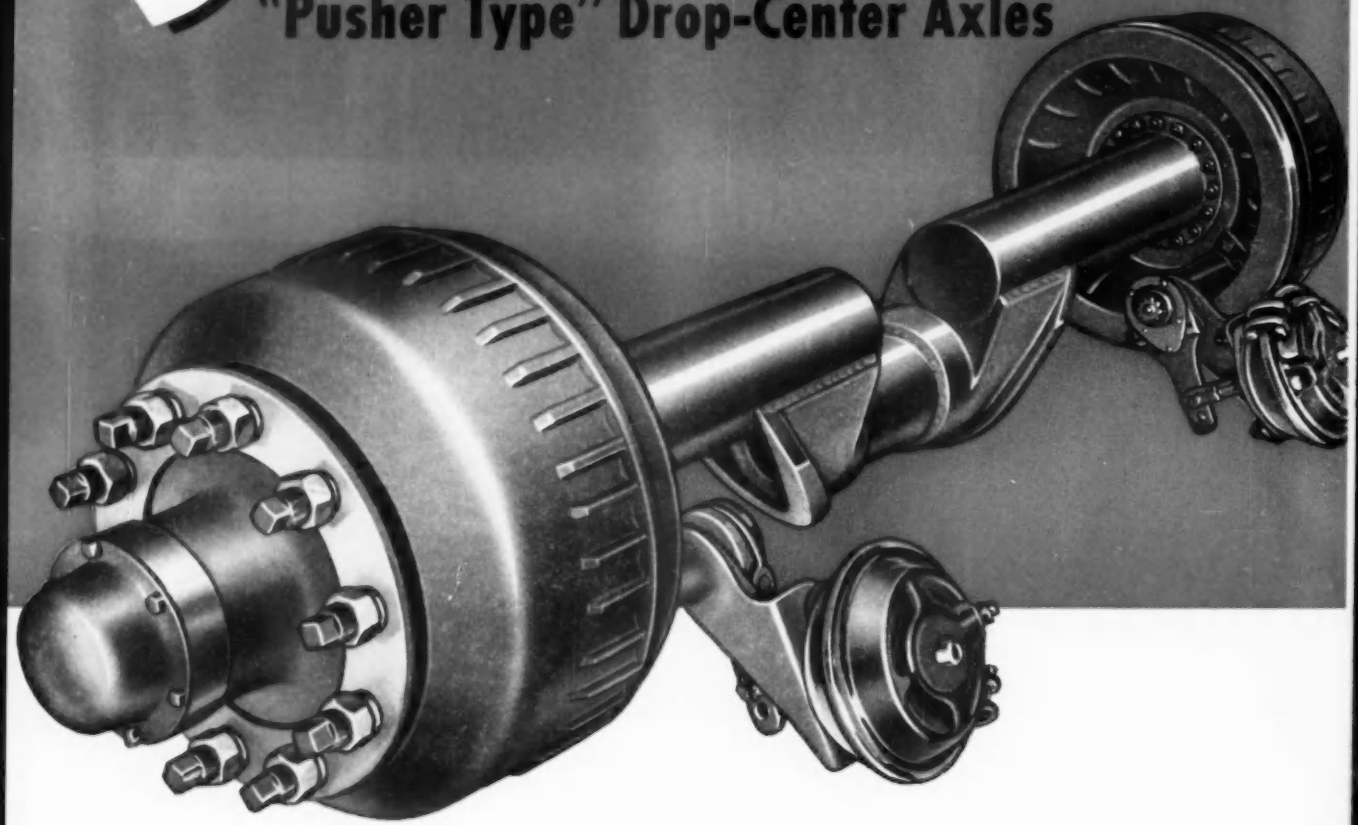

Weight for weight, Shuler Drop-Center Axles give you *maximum* strength, maximum capacity—they are made from Shuler one-piece tubular axles. The drop components have cored sides, plus a section of hollow tubing actually cut from the original axle beam.

These top-quality drop-center axles are made in capacities of 11,000 lbs. for single wheels—14,000 lbs. and 18,000 lbs. for dual wheels.

You can buy no finer drop-center axles for heavy duty trucks and truck tractor, and prices are strictly competitive. Write for full information and quotations.

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